Kindred Spirits or Intergovernmental Competition? Policy learning and the adoption of energy policies in the American states (1990 – 2010)

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1. Abstract:

The adoption of economically competitive and non-competitive climate change policies are tested as a function of internal determinants of states and two mechanisms for policy diffusion: the traditional neighboring states model for policy diffusion, and a specification that tests whether states learn from peer groups. These results are compared with census regions and sub regions. We find strong evidence for state learning within peer groups but less support for diffusion across state borders. Highly competitive policies do not exhibit differing patterns of diffusion when compared with low competition policies. There are powerful relationships between state characteristics – and in particular – the political culture of states and climate change policy adoption. These results also suggest that restricted models that test the neighboring states model likely omit important characteristics that are correlated across states, leading to incorrect findings regarding the neighboring state diffusion model in extant literature. These results call into question the use of the neighboring states model while providing additional direction for future research regarding the mechanisms of policy diffusion.

2. Introduction

With global coordinated action towards climate change at a standstill, the hopes of addressing climate change through policy initiatives has fallen to national and subnational governments encompassing a 'Madisonian' approach to climate change (Victor, House, and Joy 2005). According to this model, states may not pursue climate protection directly, but rather, focus policy efforts on an array of agricultural, forestry, transportation, renewable energy, and energy development policies that match local conditions (Matisoff 2008). These policies create an overlapping web of national, state, and regional policies that address the drivers of climate change. Ostrom (2009) argues that this approach encourages policy experiments at multiple levels, develops methods for assessing benefits and costs of each policy, and builds on the successful collective action efforts of medium- and small-scale governance units.

Climate change programs are not simply cap and trade programs, but rather, can encompass a wide array of activities. State climate change policies may take a wide variety of forms including energy efficiency programs, financial incentives for renewable energy sources, financial incentives for alternative fuels, or regulations targeting the transportation or electricity generation sectors. Energy use is broadly responsible for U.S. carbon dioxide emissions. Non-transportation energy consumption accounts for 67 percent of U.S. carbon dioxide emissions and electricity consumption alone accounts for 40 percent of carbon dioxide emissions from the energy sector. With the U.S. energy-based carbon footprint totaling 5,835 million metric tons in 2008, the U.S. is the world's second largest emitter of CO_2 (totaling 19 percent of global energy-related emissions) and has a larger carbon footprint than all of Europe combined (Energy Information Administration 2012). Thus, an understanding of U.S. energy policy is essential to solving the global climate problem.

Climate change policies may be adopted to address a specific public bad, such as air pollution, producing a positive externality of GHG reduction. Other programs attack GHG emissions more directly by promoting carbon accounting and methane recovery, or seeking to implement a regional carbon-trading program. One specific type of energy regulation that has become increasingly popular, Renewable Portfolio Standards (RPS) requires that a percentage of electricity generated or purchased in the state must come from renewable sources.

The heterogeneity of programs makes it unlikely that a single model can describe the adoption or effectiveness of all of these programs. Because of this heterogeneity, we focus specifically on energy efficiency and renewable energy policies, which represent a prominent sector of state policy activity to address climate change. State legislatures pioneered a variety of energy policies during the past two decades, yet there is insufficient insight regarding the specific conditions under which states elect to adopt certain types of these policies.

This paper is part of a larger effort to better understand why governments innovate climate change policy. In this paper, we examine policy innovation through the lens of policy diffusion, building upon Madisonian theories of federalism, which suggest that successful policy experiments by states will be mimicked and adopted by other states. In contrast, this approach says little about the initial "invention" of a policy or the subsequent effectiveness of adopted policies (for a discussion on the invention of climate change policies see (Bailey this volume; Howlett this volume; Voß and Simons this volume).

We examine state energy policies along dimensions of intergovernmental competition and mechanisms of diffusion across states. We seek to expand upon previous policy diffusion research by incorporating characteristics of collective action involved in policy design and provide empirical evidence by understanding the precise conditions under which policy innovation and diffusion are likely to occur.

We empirically assess the motivations for the adoption and diffusion of eight different state energy policies. We examine programs that promote renewable energy development, policies that promote energy efficiency, and policies that have high interstate competition implications against those that do not promote interstate competition. We test hypotheses related to regional diffusion and internal determinants, and we compare the results across models to reach broader conclusions about policy innovation and diffusion in the U.S.

Rather than expecting states to participate in a global cap-and-trade system where there is significant incentive to free-ride on the activities of other states, subnational governments engage in policy experiments that provide local benefits that take advantage of local resources and conditions. While a polycentric approach to climate change has been advocated by numerous researchers, the causal mechanisms for the diffusion of 'successful' policy experiments remain unclear, particularly at the state level (Berry and Berry 1990; Berry 1994).

3. Literature Review

3.1. Policy Learning & Policy Diffusion

Researchers have envisioned many pathways to policy diffusion: social learning, economic competition, imitation, or coercion (Shipan and Volden 2008). Under the most traditional theory of policy diffusion, and in the Madisonian tradition, U.S. states serve as laboratories of policy experimentation (Elazar 1972) and policy learning is exhibited when states mimic the successful policy experiments of other states.

Theorists have suggested that these diffusion trends are driven by communication by state legislators and bureaucrats, as well as a variety of networks aimed at delivering climate friendly technology and moving towards a low carbon economy (Bauer and Steurer this volume; Hoffman this volume). Numerous intra-state organizations such as the Council of State Governments, the Federal Commission on Intergovernmental Relations, the Citizen's Conference on State Legislatures, the National Governor's Conference, or professional associations such as the National Association of State Budget Officers, the National Association of State Conservation Officers may serve to promote policy learning and promote policy diffusion (McLendon, Heller, and Young 2005; Walker 1969).

At the international level and in Europe, similar trends have received attention in the literature. Environmental laws have been harmonized internationally, with international organizations and associations playing an important role in policy diffusion (Holzinger, Knill, and Sommerer 2008). Similarly, transnational communication has played an important role in policy diffusion, while regulatory competition has played less of a role (Holzinger, Knill, and Sommerer 2008). Recent research also suggests that while international organizations can provide pressures for harmonization, they may also provide pressures against additional stringency (Schmitt, Tosun, and Knill this volume). And global research suggests that both international pressures and domestic factors play a role in policy adoption (Stadelmann and Castro this volume).

Because policymakers are thought to attend conferences and communicate regionally, these empirical models have tested this theory by suggesting that states are more likely to mimic neighboring states, and that policies are likely to diffuse across state borders (Berry and Berry 1990; Lyon and Yin 2010; Matisoff 2008).

Several weaknesses exist with this specification of policy diffusion. First, with decreasing costs of transportation and communication, it does not seem as likely that geographic constraints are responsible for driving policy diffusion. Second, empirical research testing policy diffusion has produced mixed results. Berry & Berry (1990) find policy diffusion in state lottery adoptions; however, more recent studies that examine energy policy diffusion have failed to find compelling evidence of policy diffusion across state borders, once internal characteristics are controlled for (Lyon and Yin 2010; Matisoff 2008).

Instead, research that tests the internal determinants model against the regional diffusion model suggests that the internal determinants model - and specifically, the political resources /

motivations component of the internal determinants model seems to drive policy change (Lyon and Yin 2010; Matisoff 2008). However, as Matisoff (2008) notes, similarities across states may drive policy diffusion. States may mimic other states that share similar political, economic, and geographic resources. As tested by existing research, this specification is econometrically indistinguishable from the internal determinants model that suggests that states adopt policies in accordance with their own resources. Research that better informs why certain types of policies are successfully adopted can help researchers understand how and why policy innovation occurs, and how it diffuses across states. Further, while regional diffusion has been found in some cases and not others – current research employing event history analysis methodology has been limited to one-off studies that examine the adoption of one policy, rather than through a comparison of the adoption of multiple policies. Examining multiple policies allows us to contrast the motivations of adoption across different types of policies.

Different types of policies may follow different diffusion processes. We consider two of these possible diffusion processes for two types of policies. First, neighboring states may mimic policies that generate economic competition amongst states. Second, policy learning may occur by states imitating cultural cohorts, rather than geographical cohorts. We test these two mechanisms for diffusion across two policy types, characterized by the amount of economic competition generated by each policy.

3.2. Competition drives Policy Diffusion

In this paper, we test two possible pathways for policy diffusion. Under the first pathway, we expect policies to diffuse across state lines due to intergovernmental competition (Baybeck, Berry, and Siegel 2011). According to this theory, states strategically compete for locational choices made by individuals and firms, including business investment decisions and consumer behavior. Several recent studies support the economic competition hypothesis. Shipan and Volden (2008) demonstrate that smaller cities are less likely to adopt anti-smoking regulations until larger neighbors do so. Boehmke and Witmer (2004) suggest that early adoption of Indian Gaming contracts results from social learning, while later adoptions or modifications to policies result exclusively from economic competition. And Berry and Baybeck (2005) demonstrate that competition drives state lottery adoptions, while levels of state-determined welfare benefits are not influenced by competition. Competition may not be limited to fiscal policies. Woods (2006) finds that states respond to competitor states by reducing environmental regulatory enforcement stringency.

In the area of climate change policy, we categorize policies aimed at economic development as "highly competitive" and we hypothesize that these policies generate intergovernmental competition amongst states Policies such as a Renewable Portfolio Standards (RPS) or tax credits for renewable energy development may generate competition amongst states, as states attempt to provide a business environment that can attract renewable energy development. RPS have long been employed as a rural economic development tool by states (Wiser and Langniss 2001), and tax credits to corporations have long been employed as a mechanism to drive business investment and economic development. If states guarantee a market for renewably generated electricity through the establishment of an RPS, it provides a clear regulatory incentive for business investment in renewable energy development in that state or in neighboring states.[1]

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[1] The implementation of RPS is a bit more complex, since RPS programs generally allow the trading of Renewable Energy Credits, providing a strong harmonization pressure on states, but in

Berry and Jaccard (2001) argue that RPS use is spreading. For RPS and similar policies, the "spreading" phenomenon of certain clean energy policies may be due to a relationship between regional diffusion and policies that lead to competition between neighboring states (Hays and Glick 1997).

In contrast, if the policy impact is contained within the state, or if the policy does not have clear implications for economic development, its impacts on competition are minimal. Personal tax rebates and other individualized incentives are unlikely to generate economic competition and may be less likely to diffuse amongst states. While states compete for consumer spending or for business investment, personal tax credits and energy efficiency regulations do not provide a direct economic payoff to states or promote interstate competition. Public benefit funds, tax incentives for energy efficiency and renewables, net metering standards, and energy efficiency mandates for public buildings all may promote environmental goals, but the success of each of these programs does not directly relate to the strategic locational preference of a firm or result in increased revenue for the state.

3.3. States Emulate Kindred Spirits

Social learning, imitation, or policy emulation are common hypotheses in the policy diffusion framework. Shipan (2008), distinguishes between social learning and imitation. Boehmke and Witmer (2004) suggest an interpretation of adoption among neighboring states that entails learning and emulation. Berry (1994) uses factor analysis to derive geographic state clusters and subsequently finds evidence for policy diffusion.

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general, renewable energy must be sourced from a state with the RPS standard and RPS standards are thought to encourage renewable energy development.

We depart from existing literature by testing multiple groupings of states. We test whether states have a fixed group of states from which they learn, which we call their “Kindred Spirits”. These state cohorts are determined by a variety of cultural, ideological, geographic, and historical factors, rather than geographical neighbors. Grossback et al (2004) concludes that states are more likely to mimic states that are ideologically similar while (Case, Rosen, and Hines Jr 1993) conclude that states mimic states due to fiscal and demographic similarities. Following a similar approach, Reese, Larnell and Sands (2009), find that the adoption of tax incentives at the local level follows a largely path-dependent trend entailing the cumulative addition of old policies to new ones (i.e., marginal change). Tavits (2003) suggests that policy adoption is determined largely by “political and policy histories of policy choices,” as opposed to one that entails active learning.

Walker (1969) groups states into five factor loadings which he titles: the South, New England, Mountains and Northwest, Mid-Atlantic, and Border, Great Lakes and California; however, Walker’s categories are not geographically contiguous and are not mutually exclusive. Walker remains relatively agnostic regarding specific similarities across states that make them more likely to view each other as cohorts. Rather, Walker’s groupings are based solely on a factor analysis based on the relative order of adoption of 88 policies between 1870 and 1966. While some states, such as New York and Pennsylvania, are grouped with Mid-Atlantic States and New England, other states, such as Kansas, Colorado, and Arizona, remain ungrouped. Walker provides a model of interstate relationships based on the proclivity to adopt various policies, in large part due to the attitudes and preferences of state decision makers, and highlights the role of communication among state subsets. While these state groupings have geographic components, the most important characteristic is a political path dependency across groupings.

Thus, we expect that state history matters and despite the lapse of nearly five decades since Walker's (1969) state groupings, the logic of path dependency maintains the continuity of the Walker "regions." We expect that states with similar policy histories are more likely to learn from and emulate like-minded states. To check for robustness, we also test specifications that use Census regional groupings, and Census sub-region groupings.

3.4. Internal Determinants

The internal determinants model explains policy adoption as a function of state motivation to innovate and obstacles of innovation (Canon and Baum 1981; Glick 1981; Gray 1973; Regans 1980; Walker 1969). Stream (1999) identifies five categories of internal determinants: political context, fiscal health, problem severity/demand, and regulatory environment. In the context of climate change policy, these characteristics may include major public problems such as low air quality, important industries to the state, state energy production and consumption patterns, the state regulatory environment, political activism, state geographical and fiscal characteristics, economic capacity, the availability of alternative energy resources, the strength of local environmental interest groups, and the political ideology of the public regarding the role of government in shaping individual energy consumption choices.

3.4.1. Energy Policies: Problem Severity & Demand

States pursue climate change policies due to pressures to promote economic development, to improve environmental quality, and to improve energy efficiency. Wei, Patadia and Kammen (2010) find that energy efficiency programs and renewable portfolio standards create more jobs per unit energy than coal and natural gas, demonstrating the economic benefits clean energy policies. According to one popular model of interstate competition, governments employ tax credits and incentives to attract corporate investment (Peterson, 1981).

In rural and low income areas, RPS has been thought of as an economic development tool (Langniss and Wiser 2003), and wind turbines can provide farmers and rural residents with significant income. At the same time, wealthier areas may be more likely to oppose wind due to complaints about obstructing or altering views or due to the noise from the turbines. In wealthier areas with high wind resources, we expect less activity to promote wind electricity production.

In contrast to wind, solar is highly expensive and has been thought of as a conspicuous good or status symbol. We expect a positive relationship between the utilization solar resources and income levels and energy policies to promote solar utilization.

Another motivation to adopt energy programs likely relates to the environmental quality in a state. In states that have air quality problems and are out of compliance with National Ambient Air Quality Standards, there may be significant motivation to shift electricity consumption away from coal and oil and towards renewable sources (Matisoff, 2008). Further, energy efficiency gains can reduce the need for new electricity plants, reduce peak load burdens, and keep rates low. If states have more carbon intense economies, there are more opportunities for low cost efficiency gains. Adopting renewable energy and energy efficiency policies may be seen as a way to improve air quality, improve carbon efficiency, and keep electric rates low.

3.4.2. Internal determinants: Political context

States with liberal citizens have repeatedly been demonstrated to be more willing to adopt energy policies to influence program participation and it is important to control for the willingness of each state to use the authority of government to solve perceived policy problems (Lyon and Yin 2010; Matisoff 2008). In addition, environmental interest groups are likely to lobby for these types of policies, and states more reliant on carbon intensive industry or fossil fuel production may be less likely to adopt energy programs.

3.4.3. Internal determinants: Fiscal health

States that have wealthier populations and a larger tax base are thought to have a greater capacity for regulatory innovation and regulatory enforcement. Further, states that have wealthier citizens demand more from their governments and expect the government to provide clean air and greater environmental quality, as well as to promote increased energy efficiency and the use of renewable energy. And states with higher electricity rates may have more economic incentive or slack available to invest in renewable energy and energy efficiency programs.

3.4.4. Internal determinants: Regulatory Stringency

There is mixed evidence regarding the relationship between regulatory stringency and corporate performance. Woods (2006) finds that states respond to competitor states by reducing enforcement stringency. In contrast (Potoski 2001) finds that states race to the top in air quality. Similarly, the record on the relationship between business investment, environmental performance and regulatory stringency is mixed (Maxwell and Decker 2006; Porter and van der Linde 1995). Further, we lack time variant data on regulatory stringency across states. We proxy for regulatory stringency by using two measures of citizen engagement (voting turnout and environmental interest group membership rates), which have been demonstrated to be highly correlated with regulatory stringency (Viscusi and Hamilton 1999). We expect that states that already have higher regulatory stringency will be more likely to pursue further energy efficiency and renewable energy policies.

4. Data and Methods

4.1. Methods: Event History Analysis

We employ event history analysis (EHA) to test the likelihood that a state will adopt a policy in a given year. EHA is a well-established model in the policy diffusion literature popular for testing both internal and external determinants (e.g., Berry and Berry 1990), with particular attention paid to regional effects (Mooney 2001), which explains the occurrence of an event (e.g., policy adoption) based on individual state and policy diffusion variables.

The adoption of a policy in each state is coded as a “1” for the year of adoption and “0” if the policy has not been adopted. Once a state adopts a policy, it drops out of the data set. This coding indicates that a particular policy can only be adopted once for each state (although it can be renewed or strengthened). The model is estimated as a random effects logit model.[2] We estimate this model with robust standard errors, a series of regulatory dummy variables and a time trend to control for additional geographic and temporal heteroskedasticity. This model assumes that at any given time after 1990 states are considering the possibility of adopting a policy and will adopt it once a certain threshold is exceeded. It assumes that the baseline probability of adoption for each is equivalent for each state, given the set of variables we control for in our model.

To represent the “pressure” for a state to adopt based on the diffusion level of that particular policy for both neighboring and Walker regions, a variable is coded detailing the percentage of states within the respective region that have adopted a relevant policy in that year or earlier. We employ two specifications modeling different mechanisms at policy diffusion and

[2] An alternative specification with a Cox hazard model produced very similar results.

model two additional specifications based on Census region and subregion. First, we model a neighboring states model, where states are hypothesized to mimic their neighbors, and policies spill over across state borders. A second specification utilizes Walker regions, based on Walker's (1969) state groupings.

Using three models we test the diffusion of the two policy types for a total of 24 event history analyses allowing us to gauge the extent to which these policies motivate competition or emulation between states. The random effects logit model provides results that will be compared in three ways. First, we can test the factors that drive the adoption for each of the eight policies by using hypothesis tests on the parameter coefficients. Second, we can explore a comparison between the internal determinants model and the extent to which our policy diffusion variables are correlated with state characteristics to better understand the drivers behind policy diffusion. Finally, by comparing the effect of the two policy diffusion variables across the eight policies, we can gain a better understanding of the relationship between policy type (high-competition or low competition) policies tends to be driven by competition or emulation.

4.2. Dependent variable: policy adoption

Policy adoption data for the 48 contiguous states (Alaska and Hawaii are excluded because they have no neighboring states) begin in 1990, the first year for which most policy-relevant data could be obtained and the year that the first Intergovernmental Panel on Climate Change report was released, concluding that global climate change was likely caused by human behavior. Beginning in 1990, state agencies have kept track of greenhouse gas emissions and their efforts to combat them. While several policies were adopted prior to 1990, the vast majority of clean energy (renewable and energy efficiency) policies have been adopted since 1990, reducing possible endogeneity concerns (Balla 2001).

The adoption year of the eight policies, three representing highly competitive policies (RPS, renewable energy corporate tax credits, energy efficiency corporate tax credits) and five representing low-spillover policies (net metering, personal tax credit – efficiency and renewable, public building energy standards, public benefits funds), were obtained from the Database of State Incentives for Renewable Energy which contains information on state energy efficiency and renewable energy policies (Interstate Renewable Energy Council, 2010). The high competition policies were selected according to the literature's representation of policy characteristics motivating interstate competition for economic development. The low competition policies were selected according to the extent to which the benefits and costs of the policy are fully internalized within the state. See Appendix A for a detailed description of each of the eight policies and samples of legislation particular to certain (randomly selected) states. While the Database of State Incentives for Renewable Energy provides data on dozens of different policies, we selected only those that appear to most clearly exhibit or not exhibit economic competition. Table 1 categorizes the policies according to whether they competitive non-competitive.

<<insert table 1 about here>>

4.3. Independent variables:

Table 2 provides descriptive statistics for the variables discussed in this section.

<<insert table 2 about here>>

4.3.1. Problem Severity and Demand

We measure the motivations for states to adopt energy and renewable policy by measuring state geographic resources, air quality, energy consumption and production, and carbon intensity. Wind potential is measured as the total percentage of U.S. electricity consumption that could be produced by state wind generation. This calculation assumes the utilization of all high-quality wind at 30 meters hub height, with 25 percent efficiency and 25 percent losses (Elliot and Schwartz 1993). Solar potential is coded as annual average global radiation for each state (kWh/M^2/day). These data were received from the EPA directly via personal communication and are based on the National Solar Radiation database from the National Renewable Energy Laboratory. Biomass potential is measured in thousand dry tonnes / year / capita and is obtained from table 10 in Milbrandt (2005).

Air quality is measured by criteria air pollutants emissions. This variable is calculated using the average percentage of a state's population living in a nonattainment area for six major criteria air pollutants: NO_x, SO_2, CO, Pb, I hour Ozone, and PM-10. This variable is calculated annually and has the potential to range from 0 to 6 (i.e. if 100% of a state's residents were living in a non-attainment area for all six pollutants the state would receive a 6.)

The carbon dioxide intensity of a state is measured in tons per thousand of current 2010 dollars of Gross State Product (GSP). Carbon dioxide emissions data were collected from the Energy Information Administration (EIA) (Energy Information Administration, 2012).

4.3.2. Political Context

We estimate the ideology of a state's citizens using a previously established citizen ideology index, which seeks to measure the mean position on a liberal-conservative continuum of the "active electorate" in a state, which is scaled from 0 (conservative) to 100 (liberal) (Berry, Ringquist, Fording and Hanson 1998). This measurement also functions as a proxy for other political characteristics of states, such as the party control of the state legislature, and is preferred over other measurements of state liberalism because it is a continuous, dynamic longitudinal measure of the mean state ideology. In addition it is sensitive to the difference between a minimal and overwhelming legislative majority and variation in parties' ideological positions across states. This index is constructed by weighting the ideology of the district's incumbent by the support they received and adding it to the weighted ideology of the state's average opposition party representatives.

Sierra club membership is obtained directly from Sierra Club. Energy production per capita is collected from the EIA.

4.3.3. Fiscal Health

GSP per capita data is drawn from the U.S. Bureau of Economic Analysis. State revenue data is drawn from the U.S. Census of State Governments.

4.3.4. Regulatory Stringency

We proxy for regulatory stringency by measuring civic engagement via voter turnout, which has a well-established relationship with regulatory stringency (Viscusi and Hamilton 1999). To gauge state regulatory stringency, we measure voter turnout political participation by we gathering congressional (U.S. House) voting results occurring every two years and dividing that by state population. Because House seats are up for re-election every two years with variation amongst states in terms of the percentage of seats under consideration, we employ a method of first averaging the total number of state House votes (across all state candidates in a given election cycle) every two years and then interpolating for gap years based on these averages.

4.3.5. Additional Control Variables

In addition, we include dummy variables measuring Independent Service Operator (ISO) affiliations, whether or not state restructuring is active, state size and population density, and for the electric grid. ISOs that correspond only with one state were not included due to perfect collinearity.

5. Results

Table 3 shows the random effects logit regression results for the internal determinants specification without accounting for spillover or policy learning. Table 4 shows the economically competitive policies with Walker, Neighboring state, and Census region and Subregion specifications, while Tables 5 and 6 show results for the less competitive policies.

5.1. Internal Determinants

Without controlling for state diffusion, we explain as much as 80 percent of the variation of a state's likelihood of adopting a policy in a particular year (see Table 2). We also find powerful relationships between specific state characteristics and the likelihood of adoption. Increasing solar density has no statistically significant effect on the adoption of any policy. Wind potential is significant and positive for several policies by itself (public benefits, net metering) but with less of an increase in likelihood of adoption at increasing levels of gross state product per capita. Biomass resources are negatively correlated with the adoption of RPS

Controlling for other internal determinants, voting turnout positively influences the likelihood of adoption for RPS, renewable energy and energy efficiency corporate tax credits, public benefit funds, and renewable energy and energy efficiency personal tax credits. States with worse air quality are more likely to adopt RPS, public benefit funds, and building standards. Increasingly liberal states have a greater likelihood of adopting RPS, tax incentives for renewables, public benefit funds and building standards. Higher electricity prices are correlated with fewer incentives for renewables, yet higher incentives for net metering and public benefit funds. Increased energy consumption is correlated with fewer incentives for renewables and efficiency. States with greater CO_2 intensity are less likely to adopt public benefit funds. And environmental group membership is correlated with fewer personal efficiency incentives yet greater net metering incentives and corporate tax incentives for renewables. State product per capita is significant and positive for public benefits and corporate energy efficiency.

5.2. Internal Determinants and Policy Diffusion

Including state adoption patterns, we can explain up to 86 percent of a state's likelihood of adopting a policy in a given year. Controlling for neighboring state and Walker region adoption modestly influences the statistical significance of the internal determinants.

5.2.1. Neighboring States Models

Of the three highly competitive policies, only one policy (corporate tax incentives for renewable energy) shows a statistically significant parameter estimate, and it demonstrates a negative relationship. Among the five low competition policies, no policies have a positive and statistically significant parameter estimate. Two policies (personal tax incentives for renewables and energy efficiency) have a negative relationship across state borders.

5.2.2 Walker Regions Models

All eight policies are strongly positively significant for the Walker diffusion metric.

5.2.2. Census Region Models

All eight policies are strongly positive and statistically significant for Census subregion, and seven policies are significant for Census region.

6. Discussion

6.1. Internal determinants versus diffusion

Table 7 below highlights the results for the diffusion variables across the eight policies without controlling for internal determinants. Comparing these results to the parameter estimates after controlling for internal determinants demonstrates the amount of variation absorbed by the diffusion models. For neighboring states, much of the statistical significance of the neighboring models is absorbed by adding the internal determinants variables and vastly changes the interpretation of the results. Without internal determinants controls, four policies are statistically significant (and are all positive). Once controls are added, three remain significant, but all of these change valence and demonstrate differentiation, rather than emulation. In contrast, for the Walker model, adding internal controls does not decrease the significance of the model – all policies show policy learning across Walker regions with and without internal determinants controls. This result highlights the susceptibility of the Neighboring states model to specification error and excluded variable bias. Results of the neighboring states model are highly dependent on the variables that are included in the model.

<<insert Table 7 about here>>

By examining regression results that exclude the internal determinants variables, or alternatively exclude the policy diffusion variables, it is possible to understand the variation that is absorbed by the diffusion variables, and the unique contribution of those measures to our understanding of policy diffusion and innovation. For example, the neighboring model of the public benefits funds diffusion explains 76.4 percent of the pattern of state policy adoption. The internal determinants model alone explains 76.2 percent of this probability, while the diffusion variable alone explains 32 percent of the variation. This suggests that nearly all 32 percent of the variation explained by the neighboring states model is explained by traits that are similar across neighboring states, and that less than one percent of the variation is due to policy learning across neighboring state boundaries. In contrast, for the Walker model, a total of 81 percent of variation is explained by the full model and 48 percent is explained by just the diffusion variable, suggesting that the Walker region contributes 5 percent of unique variation of policy adoption and 43 percent that overlaps with the internal determinants model, suggesting much stronger policy learning effects across Walker regions.

6.2. High Competition vs. Low Competition

We expected high competition policies to diffuse across neighboring states, while low competition policies would diffuse across Walker regions. There is mixed evidence to support this hypothesis. Amongst high competition policies, only one policy (corporate tax incentives for renewables) differentiated amongst neighbors, and no policies demonstrated emulation. And amongst the 5 policies expected *not* to diffuse across state borders, personal tax incentives showed differentiation across state borders. Although we only test our theory on a limited number of policies, highly competitive policies do not appear to diffuse more readily across state borders, and there is also evidence for differentiation for these types of policies. These results support findings by Holzinger, Knill and Sommerer (2008; 2011) that do not show diffusion due to regulatory competition in environmental policy and by Schmitt, Tosun, and Knill (this volume) that show a complicated relationship between regulatory pressures and policy adoption.

Amongst the low competition policies, Walker regions were more predictive for policy adoption. All 8 policies diffused across Walker regions. However, most of these policies also diffused across census regions and sub-regions. In robustness checks where the Census region diffusion variables are included in the regression as well as Walker regions, Census regions become statistically insignificant and Walker regions remain significant. This finding provides strong evidence that Walker regions are highly correlated with policy adoption.

Of particular interest are the results for corporate tax incentives for renewables as well as personal tax incentives for renewables. When modeled with neighboring states, we see evidence of differentiation and perhaps competition. When modeled with Walker regions, we see evidence of policy learning and imitation.

6.3. Diffusion hypotheses

More than anything, our results demonstrate that across all types of policies, political culture - as measured 57 years ago, matters. After controlling for the observable internal determinants - the most predictive characteristics of each state is that states' political culture, as measured by its Walker region. In all 8 policies tested, adoptions by Walker region cohorts is a statistically significant predictor of future policy adoption, even when Census region diffusion is included as a control variable.

This suggests that states have a relatively fixed set of states that they learn from, regardless of the type of policy, and that reference groups have remained relatively fixed since 1850 (though Walker demonstrates some movement over time). Some of these states are neighbors and others are not. This suggests that instead of policies diffusing across neighbors, they diffuse in the same pattern that they did pre 1965 (and spanning back to the 1800s), suggesting that globalization is not to credit / blame for this, but that state policy seems to be path dependent. States emulate other states because they have always emulated those states and because each state is endowed with fixed political attributes that make the state more innovative than others. More innovative states move first, and then other states follow the innovators in their "Walker region" that they seek to emulate.

Moreover, these data (presented in Appendix B) allow us to examine whether certain states are more frequently first-movers for each Walker region. In region 1, Texas was the first mover in 2 of the 8 policies; in region 2, New York was a first mover in 6 of the 8 policies, and Massachusetts was a first mover in 2 of the 8 policies; in region 3, Maryland was the first mover in 3 of the 8 policies, and Oregon was the first mover in 2 of the 8 policies. In region 4, New York was the first mover in 6 of the 8 policies, and Wisconsin was the first mover in 2 of the policies. And in region 5, California was the first mover in 3 of the 8 policies. This analysis points to just a few states being particularly important in policy innovation – leading to the diffusion of energy policies in the U.S. states. While this analysis has only been conducted with 8 policies, it suggests that certain states are more likely to be policy innovators in the area of energy and climate.

Different Walker regions were also more likely to adopt different types of policies. RPS were adopted in all 8 of region 2 states and in 6 of 7 of region 4 states, while only being adopted in 4 of 17 of region 1 states, and in 4 of 14 of region 3 states. Public benefit funds have a similar pattern. In contrast, regions 1 and 3 were much more likely to adopt personal and corporate tax credits than regions 2 or 4. This finding suggests a preference for policy types by states that share a similar political culture.

The neighboring states hypothesis is not supported in any of the 8 models. These results question the applicability of the neighboring states specification for policy diffusion research. Further, for corporate and individual tax incentives for renewable energy, the neighboring state hypothesis has a negative parameter estimate, suggesting that states differentiate rather than emulate from each other. This finding could be evidence of intergovernmental competition.

6.4. Internal Determinants Hypotheses

6.4.1. Problem Severity and Demand

States demonstrate a mixed record at tailoring policies to take advantage of unique geographic attributes. Solar density is not be correlated with renewable energy policies. Wind potential is positively correlated with renewable energy programs including net metering. Biomass capacity seems to deter RPS policy adoption.

Some policy adoptions, RPS Public Benefit Funds, building standards, and tax incentives for rewewables are associated with better air quality, suggesting that states do not adopt these programs to improve air quality, but already have better air quality when adopted.

Increases in CO_2 intensity are positively correlated for corporate tax incentives for efficiency, but are negatively correlated for public benefit funds. This suggests that states may adopt some energy policies to address carbon intensity, but that carbon intense industry may also lobby against certain new energy programs promoting renewables or energy efficiency. States with less energy consumption are more likely to adopt tax incentives for renewables and for efficiency, suggesting that those with the greatest energy consumption are least likely to do something about it. This result is consistent with the political market hypothesis and previous findings that states with larger reliance on the fossil fuel industry were less likely to adopt energy regulations (Matisoff 2008). Perhaps the most consistent finding within this manuscript and previous and accompanying research is that more liberal states are more likely to adopt policies to address energy efficiency and renewable energy. Climate change is a political challenge, more than an economic or technological challenge (Bailey this volume). And states with large environmental interest group memberships are most likely to adopt a wide range of energy policies. This result demonstrates that states are responsive to citizen ideology and organized environmental interest groups, but less responsive to other problem characteristics.

6.4.2. Fiscal Health

State revenue is statistically significant as a motivation for public benefit funds and corporate incentives for energy efficiency. Given the structure of PBF, which allows utilities to recoup costs of energy efficiency projects, it is unsurprising that states with larger government budgets may have the capacity and funding to design and implement these types of programs. Combined with results that suggest that Incentives for efficiency suggest that additional slack in budgets may be helpful to adopt efficiency initiatives.

7. Conclusions and directions for additional research

This study provides implications for the study of policy diffusion and the specification of event history analysis models, as well as implications for the adoption and diffusion of energy programs. The neighboring states model of policy diffusion seems to consistently underperform other methods of modeling policy learning. While supportive findings can be cherry-picked from the literature, these findings do not compare the neighboring state hypothesis with other mechanisms of grouping states. We find that Walker regions provide more explanatory power in all 8 policies than the neighboring state model. Walker is a statistically significant (and one of the most correlated) predictor of policy adoption in all 8 policies and provides a unique contribution to our understanding of policy diffusion, separate from internal determinants. These Walker regions hold even after controlling for geographic, political, economic, and environmental characteristics of states, and even when Census region adoption included as a control variable. In contrast, internal determinants seem to absorb most of the variation explained by the neighboring states approach.

Further, theoretically, there are significant problems with the neighboring state model. While intergovernmental competition is the most compelling story behind this model, many policies do not facilitate the type of competition that would drive neighboring state diffusion. Further, it is unclear whether competition should drive states to differentiate themselves or to imitate each other. In these findings, states mimic each other for certain policies, but differentiate themselves for others. As a result, we do not believe that the neighboring states model should continue to be employed unless there are clear reasons to believe that state competition across state lines is driving policy adoption.

That states emulate a fixed set of states that they view as cohorts has enormous implications for policy that depart from much of existing literature. The vast majority of literature suggests that states learn from each other or compete with each other. Because states appear to take cues from a fixed set of states, in an ideal policy world where policymakers could manipulate policy experiments (or where federal funding for policy experimentation is doled out to specific states), it would make sense to seed policy experiments to states in different Walker regions. As discussed above, certain states appear to be clear leaders in the Walker regions. New York is a leader amongst region 2 and region 4. Maryland, Massachusetts, Oregon, Wisconsin, Texas, and California also appear to be consistent policy innovators, likely because these (generally larger states) have larger budgets, capacity, and culture that promote policy innovation. This lesson provides insight for international policy diffusion as well. If certain states are consistent leaders and others are consistent laggards, it may be possible to seed policy experiments in states that are more open to policy experimentation. International institutions and networks can be used to push laggards to adopt successful policy experiments. These results are consistent with Howlett and Joshi-Koop (2011), who find that the training and expertise of policy analysts dictates whether a government is open to policy experimentation.

Certain types of policy are more likely to be adopted in states with different political cultures. Walker regions 2 and 4 were near-universal adopters of RPS programs and Public Benefit funds, while these programs were very unpopular in regions 1 or 3. In contrast, tax benefits were relatively more popular in these regions than in regions 2 or 4. This suggests that policy-makers may win greater acceptance by choosing culturally appropriate policies for states.

The most consistent correlations across energy policies point towards political attributes of specific states including citizen interest groups and political liberalism. To increase the policy adoption of climate change policies, the results of the model emphasize the importance of citizen interest groups, paired with specific policy types that might make states more (or less) receptive to policy adoption. For participants in the state policy process, these results provide useful guidance regarding the possible acceptance of a particular policy, based on its characteristics.

Further research can continue to address the causal drivers of intergovernmental competition, and whether we ought to expect states to imitate each other or to compete with each other. And research can do more to demonstrate how and why Walker regions remain such a powerful predictor of policy adoption. Finally, while we have been able to understand patterns in state policy diffusion, it is unclear whether policies diffuse more effectively when originally adopted by a highly innovative state, or perhaps when initially adopted by a traditionally less innovative state.

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Table 1. Policies by type

	Corporate Incentives / High Competition	**Individual Incentives / Low Competition**
Regulatory Renewables	Renewable Portfolio Standards	Access Laws or Net Metering
Financial Incentives Renewables	Business and Corporate Tax Credits	Personal Tax Credits
Regulatory Efficiency		Public Building Energy Standards; Public Benefits Funds
Financial Incentives Efficiency	Business and Corporate Tax Credits	Personal Tax Credits

Table 2. Summary Statistics

Variable	**Obs**	**Mean**	**Std. Dev.**	**Min**	Max
Solar Density	50	4.2364	0.5374268	2.42	5.48
Wind Potential	48	3.466667	7.188239	0	36
Solar * GSPPC	50	0.1409899	0.0273571	0.0888764	0.2127408
Wind * GSPPC	48	0.1099657	0.2201551	0	1.022987
Biomasspc	50	0.0028044	0.0044776	0.000166	0.0267658
Voter Turnout	50	0.3231859	0.0573639	0.2259635	0.4557617
Criteria Pollutant Index	50	0.1099067	0.1371067	0	0.7219166
Energy ProdPC	50	629.2251	2395.273	0	16435.89
Electricity Price	50	8.3724	2.354675	5.13	16.41
ConsumptionPC	50	0.3905671	0.1611921	0.2130212	1.017504
CO2 Intensity	50	0.7104126	0.526463	0.2383368	2.719277
Liberalism	50	43.25198	14.65662	15.3974	77.25655
SierraPC	50	0.0019967	0.0011604	0.000425	0.0054301
State Government RevenuesPC	50	4.623378	1.083147	3.13186	10.84905
GSPPC	50	0.0334549	0.0059718	0.0229063	0.0522705
Pop Density	50	70.23371	96.59189	0.4232182	438.018
Area SQKM	50	183235.3	222705.3	2706	1481347
EastGrid	50	0.76	0.4314191	0	1
WestGrid	50	0.2	0.404061	0	1
ISONE	50	0.12	0.3282607	0	1
PJM	50	0.18	0.3880879	0	1
SPP	50	0.08	0.2740475	0	1
MISO	50	0.16	0.370328	0	1
Restructuring	50	0.12	0.3282607	0	1

Table 3. Internal Determinants Specification for all 8 policies: Random Effects Logistic Regression Results, Robust Clustered Standard Errors in Parentheses, Clustered by State

	RPS	Corp.Tax Eff.	Corp. Tax Renew	Pub Ben	Bldg Stds	Net Meter	Pers. Tax Eff	Pers. Tax Renew
Solar Density	-1.024	-1.277	-0.222	1.033	1.652	-1.412	0.897	1.941
	(5.374)	(2.027)	(2.211)	(3.099)	(1.411)	(2.905)	(1.860)	(1.399)
Wind Potential	0.432	-0.206	0.289	1.257***	-0.817*	0.381**	-0.0597	-0.292
	(0.391)	(0.146)	(0.280)	(0.402)	(0.481)	(0.151)	(0.265)	(0.203)
Solar * GSPPC	56.88	57.01	-20.11	-107.5	-8.456	2.297	-48.52	-12.68
	(138.3)	(52.30)	(47.72)	(84.49)	(42.03)	(84.40)	(65.99)	(46.10)
WindPot * GSPPC	-3.665	3.298	-2.607	-45.18***	14.76*	-10.02***	-1.294	5.262
	(8.649)	(3.000)	(5.995)	(11.21)	(8.666)	(2.352)	(4.654)	(4.212)
BiomassPC	-850.2**	53.46	-550.6	-131.5	51.35	53.50	142.6	154.4
	(396.4)	(143.6)	(358.7)	(223.1)	(163.5)	(200.0)	(443.7)	(137.9)
HouseVote	29.44***	10.23*	15.79***	13.35***	15.69	-2.996	9.189*	11.10**
	(5.863)	(5.441)	(5.885)	(4.956)	(10.58)	(6.648)	(4.776)	(4.626)
CritIndex	12.49***	-0.549	2.664	8.090***	4.378**	-0.138	-0.132	5.461**
	(2.893)	(3.627)	(3.444)	(2.060)	(2.190)	(1.764)	(2.566)	(2.698)
EnergyProdPC	-0.00163	-0.000133	0.000580*	0.000414	-0.000729	9.16e-06	0.000675**	-0.00126
	(0.00199)	(0.000201)	(0.000325)	(0.000527)	(0.00161)	(0.000138)	(0.000333)	(0.00180)
ElectricPrice	0.367*	-0.297	-0.942***	0.659***	-0.0765	0.366**	-0.330	-0.154
	(0.212)	(0.218)	(0.231)	(0.190)	(0.213)	(0.152)	(0.270)	(0.149)
ConsumptionPC	3.952	-7.543	-19.86**	-2.034	-3.007	1.711	-16.00*	-4.994
	(4.782)	(6.572)	(8.184)	(10.28)	(7.165)	(1.653)	(9.545)	(3.050)
CO2Intensity	0.633	1.470*	0.751	-3.546**	-0.954	0.185	-2.178	2.939
	(3.236)	(0.872)	(1.421)	(1.547)	(2.057)	(0.795)	(2.524)	(2.119)
Liberalism	0.0883***	0.0497	0.186***	0.0978***	0.0915**	-0.0138	0.0396	0.0684**
	(0.0323)	(0.0310)	(0.0471)	(0.0355)	(0.0414)	(0.0202)	(0.0324)	(0.0273)
SierraPC	8.129	-141.4	74.71**	-79.25	11.26	766.0***	-724.4**	-350.8
	(73.97)	(285.4)	(37.92)	(71.90)	(33.69)	(269.6)	(369.6)	(286.8)
StateRevenuePC	0.191	0.365***	-0.0845	1.716***	-0.231	0.198	-0.103	0.0879
	(0.245)	(0.123)	(0.215)	(0.217)	(0.184)	(0.159)	(0.221)	(0.162)
GSPPC	-36.24	-261.7	123.3	367.0	51.53	76.72	90.82	54.67
	(566.0)	(222.1)	(207.6)	(325.3)	(195.2)	(338.4)	(274.8)	(186.6)
PopDens	0.0199**	0.00794*	0.0116	0.00231	-0.000128	-0.00588**	0.00825	0.00891*
	(0.00832)	(0.00445)	(0.00738)	(0.00473)	(0.00424)	(0.00299)	(0.00712)	(0.00498)
LandSqKM	9.46e-06*	7.81e-06	1.75e-05**	2.76e-05**	-1.98e-06	-4.61e-06	4.91e-06	-8.28e-06
	(5.29e-06)	(8.93e-06)	(7.15e-06)	(1.10e-05)	(1.06e-05)	(6.26e-06)	(7.13e-06)	(5.80e-06)
EastGrid	-3.295*	-20.41**	2.875	1.730	-11.36*	3.544***	-2.754	-3.784**
	(1.814)	(8.766)	(2.083)	(2.801)	(6.222)	(0.858)	(1.973)	(1.831)
WestGrid	-2.355	-21.95**	-2.044	0.312	-11.34**	3.331***	0.609	-2.500
	(1.511)	(9.164)	(1.605)	(2.122)	(5.027)	(1.162)	(1.806)	(1.798)
ISONE	-0.471	-0.850	-2.930	3.737***	-3.382**	-2.228	0.849	-3.552**
	(1.843)	(1.900)	(1.821)	(1.411)	(1.345)	(1.407)	(1.785)	(1.478)
PJM	-2.549	-0.682	-2.988*	3.190**	-0.454	-0.0689	0.251	-4.575**
	(1.622)	(1.675)	(1.812)	(1.389)	(1.043)	(0.972)	(1.344)	(1.974)
SPP	-1.212	0.617			1.908	0.159	2.336	
	(1.378)	(1.257)			(1.648)	(1.418)	(2.311)	
MISO	3.276**	-1.242		3.286***	-0.0494	0.744	-2.753**	-2.179**
	(1.364)	(0.874)		(1.131)	(1.238)	(0.929)	(1.311)	(1.045)
Restructure	1.200*	0.300	-1.251	0.207	-0.121	0.217	-1.378*	-0.798*

	(0.644)	(0.322)	(0.981)	(0.625)	(0.437)	(0.390)	(0.776)	(0.445)
Time	0.678**	0.171	0.216	0.439*	0.291***	0.168**	0.380**	0.211*
	(0.269)	(0.113)	(0.210)	(0.259)	(0.0861)	(0.0784)	(0.174)	(0.111)
Constant	-37.33	18.86	-11.67	-38.42**	-7.213	-6.704	-0.0572	-13.17*
	(27.13)	(0)	(10.57)	(15.87)	(12.18)	(10.95)	(8.938)	(7.963)
Obs,	725	725	554	666	725	725	725	666
pR^2	0.795	0.318	0.571	0.762	0.490	0.415	0.395	0.300
X^2	187.7	.	1557	221.4	187.7	180.9	156.7	132.3

p-value: * < .1; ** < .05; *** < .01

Table 4. Highly Competitive Energy Policies: Random Effects Logistic Regression Results, Robust Standard Errors in Parentheses, Clustered by State

VARIABLES	RPS NN	RPS Walker	RPS Census	RPS SubRegion	Corp Eff NN	Corp Eff Walker	Corp Eff Census	Corp Eff Subregion	Corp Renew NN	Corp Renew Walker	Corp Renew Census	Corp Renew Subregion
Diffusion Variable	1.045	11.83***	9.726***	13.24***	-2.563	16.73***	9.460***	7.135***	-42.80***	32.26***	0.976	10.63**
	(1.403)	(3.644)	(2.470)	(2.596)	(2.319)	(2.914)	(3.515)	(1.836)	(14.95)	(11.15)	(6.535)	(5.295)
Solar Density	-1.358	-3.920	-3.751	-3.985	-1.881	-1.302	-0.706	0.334	15.13**	-5.626	-0.155	1.587
	(5.020)	(4.863)	(5.241)	(6.146)	(2.134)	(2.362)	(2.082)	(1.997)	(6.267)	(3.581)	(2.320)	(2.094)
Wind Potential	0.409	1.011*	0.479	0.487	-0.193	-0.198	-0.241*	-0.219*	-0.0104	0.466	0.283	0.413
	(0.390)	(0.551)	(0.409)	(0.438)	(0.146)	(0.157)	(0.135)	(0.132)	(0.818)	(0.416)	(0.287)	(0.258)
Solar * GSPPC	59.45	162.1	155.5	185.0	72.91	70.45	30.04	-0.731	-488.5**	166.3*	-20.90	-54.57
	(127.6)	(119.6)	(135.1)	(163.4)	(53.52)	(59.27)	(54.75)	(49.54)	(224.7)	(96.14)	(48.11)	(47.50)
WindPot * GSPPC	-3.295	-15.74*	-5.457	-4.675	3.289	1.634	4.565	2.983	-0.225	0.0796	-2.465	-2.474
	(8.764)	(8.999)	(8.617)	(8.976)	(2.899)	(3.093)	(2.810)	(3.096)	(19.78)	(7.524)	(5.991)	(5.560)
BiomassPC	-826.7**	-1,250**	-871.2***	-776.2**	13.05	2.702	70.69	65.08	-971.1	-1,232	-542.3	-715.4*
	(372.6)	(622.9)	(328.8)	(384.8)	(142.4)	(175.2)	(137.2)	(115.0)	(2,295)	(765.2)	(371.5)	(367.8)
HouseVote	29.44***	33.10***	30.30***	31.72***	9.724*	14.34*	7.622	11.92*	41.71**	14.82***	15.70***	15.27***
	(5.931)	(7.748)	(5.829)	(5.408)	(5.167)	(8.661)	(4.873)	(6.194)	(16.28)	(4.147)	(5.969)	(4.415)
CritIndex	12.25***	12.24***	11.13***	8.330	-0.294	-1.119	-0.739	-0.840	7.507	-1.004	2.510	0.409
	(2.845)	(4.028)	(3.171)	(5.169)	(3.498)	(4.260)	(3.642)	(4.063)	(6.575)	(5.891)	(3.635)	(4.134)
EnergyProdPC	-0.00104	-0.000417	-0.000910*	-0.000963**	-0.000180	-0.000277	-0.000104	-0.000144	0.00165**	-0.000199	0.000577*	0.000432
	(0.00163)	(0.000474)	(0.000466)	(0.000481)	(0.000196)	(0.000213)	(0.000213)	(0.000193)	(0.000650)	(0.000557)	(0.000337)	(0.000443)
ElectricPrice	0.422*	-0.517	0.0884	0.0890	-0.289	-0.354	-0.345	-0.268	-2.938***	-0.933***	-0.943***	-0.895***
	(0.221)	(0.402)	(0.245)	(0.252)	(0.201)	(0.224)	(0.231)	(0.235)	(0.934)	(0.261)	(0.232)	(0.243)
ConsumptionPC	4.272	2.201	3.962	7.941*	-6.922	-10.40	-9.003	-8.734*	-59.41***	-14.07	-19.85**	-17.09*
	(4.894)	(6.134)	(4.957)	(4.459)	(6.144)	(6.477)	(7.191)	(5.226)	(21.40)	(9.468)	(8.270)	(9.395)
CO2Intensity	0.0252	-1.723	0.646	-1.494	1.540*	2.227**	1.303	2.018*	5.737**	1.827	0.737	0.557
	(3.265)	(3.788)	(2.743)	(3.601)	(0.801)	(1.064)	(0.918)	(1.080)	(2.592)	(1.171)	(1.429)	(1.719)
Liberalism	0.0849**	0.150***	0.128***	0.111**	0.0516*	0.0287	0.0442	0.0234	0.469***	0.130***	0.185***	0.184***
	(0.0335)	(0.0548)	(0.0434)	(0.0461)	(0.0301)	(0.0329)	(0.0311)	(0.0296)	(0.149)	(0.0499)	(0.0482)	(0.0442)

StateRevenuePC	0.146	-0.0276	-0.0780	0.125	0.341***	0.542***	0.463***	0.380***	-0.00563	-0.244*	-0.0829	-0.0446
	(0.218)	(0.310)	(0.307)	(0.351)	(0.124)	(0.154)	(0.142)	(0.127)	(0.623)	(0.141)	(0.217)	(0.210)
GSPPC	-50.14	-369.8	-337.7	-455.8	-326.2	-260.3	-159.0	-40.75	2,112***	-598.7	125.7	260.5
	(522.8)	(494.0)	(519.1)	(617.7)	(231.7)	(250.5)	(230.5)	(214.1)	(818.7)	(382.9)	(208.2)	(195.8)
PopDens	0.0194**	0.0259***	0.0250***	0.0267***	0.00852**	0.0130***	0.00851**	0.00981**	0.0327***	0.00976	0.0115	0.00953
	(0.00770)	(0.00899)	(0.00801)	(0.00823)	(0.00433)	(0.00468)	(0.00421)	(0.00449)	(0.0124)	(0.00975)	(0.00750)	(0.00668)
LandSqKM	9.80e-06*	1.00e-05	1.17e-05*	8.55e-06	6.10e-06	1.77e-05*	1.06e-05	9.51e-06	4.21e-05***	1.30e-05	1.75e-05**	1.61e-05**
	(5.35e-06)	(6.35e-06)	(6.40e-06)	(6.33e-06)	(8.21e-06)	(1.07e-05)	(8.95e-06)	(9.28e-06)	(1.56e-05)	(1.08e-05)	(7.19e-06)	(7.49e-06)
EastGrid	-3.393*	-2.639*	-3.478**	-3.162	-21.07**	-16.35	-19.52***	-19.19**	0.392	5.970*	2.874	3.483
	(1.838)	(1.424)	(1.771)	(2.227)	(9.033)	(10.43)	(1.320)	(8.782)	(1.751)	(3.494)	(2.082)	(2.118)
WestGrid	-2.411	-1.624	-3.195**	-2.027	-22.31**	-22.58**	-21.36	-20.63**	-5.155*	-2.709	-2.059	-1.593
	(1.542)	(1.207)	(1.590)	(2.209)	(9.606)	(10.72)	(0)	(9.016)	(3.105)	(1.756)	(1.620)	(1.785)
ISONE	-0.766	-3.886***	-2.696	-3.242	-1.002	-1.324	0.153	-0.00779	2.016	-6.905**	-2.921	-2.651
	(1.718)	(1.384)	(1.732)	(2.019)	(1.725)	(1.803)	(1.916)	(2.228)	(3.436)	(2.782)	(1.789)	(1.635)
PJM	-2.463	-4.704**	-3.024	-3.037	-0.802	-0.634	-0.160	-0.520	-8.541*	-5.171***	-2.913*	-2.724
	(1.583)	(2.024)	(2.054)	(2.161)	(1.575)	(1.774)	(1.720)	(2.012)	(5.099)	(1.810)	(1.751)	(2.330)
SPP	-0.957	-0.363	-2.023	0.156	0.961	-0.361	0.897	0.223				
	(1.319)	(1.855)	(1.600)	(1.557)	(1.412)	(1.193)	(1.173)	(1.233)				
MISO	3.256**	0.449	4.833***	5.200***	-1.309	-1.211	-0.826	-0.749				
	(1.338)	(1.840)	(1.533)	(1.581)	(0.867)	(1.105)	(0.877)	(0.955)				
Restructure	1.053	0.742	0.798	0.734	0.478	0.612*	0.325	0.311	0.504	-1.528*	-1.263	-1.638*
	(0.659)	(0.888)	(0.768)	(0.745)	(0.315)	(0.325)	(0.313)	(0.339)	(0.970)	(0.780)	(0.926)	(0.962)
Time	0.627**	0.215	0.221	0.00150	0.238	-0.292***	-0.0396	0.0692	1.125**	-0.106	0.208	0.0993
	(0.245)	(0.242)	(0.265)	(0.343)	(0.155)	(0.104)	(0.103)	(0.103)	(0.505)	(0.242)	(0.225)	(0.219)
Constant	-35.25	-20.02	-25.97	-24.36	21.81	11.99	16.82*	10.88	-88.25***	11.11	-11.78	-19.99*
	(25.50)	(23.28)	(22.65)	(23.93)	(0)	(0)	(9.276)	(0)	(30.65)	(14.86)	(10.57)	(10.45)
Obs,	725	674	725	725	725	674	725	725	554	520	554	554
pR^2	0.796	0.853	0.832	0.851	0.338	0.495	0.341	0.397	0.844	0.659	0.571	0.597
X^2	246.8	2169	323.2	372.7	.	.	.	.	.	24423	4241	1052

p-value: * < .1; ** < .05; *** < .01

Table 5. Non-Competitive Energy Policies(a): Random Effects Logistic Regression Results, Robust Standard Errors in Parentheses, Clustered by State

	Pubben NN	Pubben Walker	Pubben Census	Pubben Subregion	Bldg Stds NN	Bldg Stds Walker	Bldg Stds Census	Bldg Stds Subregion	Netmeter NN	Netmeter Walker	Netmeter Census	Netmeter Subregion
Diffusion Variable	1.475	8.188***	8.975**	8.466***	-0.512	6.608***	9.141***	11.16***	0.331	9.694***	6.771***	8.806***
	(1.608)	(2.411)	(3.697)	(2.500)	(0.867)	(1.826)	(2.104)	(2.959)	(1.058)	(2.333)	(2.288)	(1.700)
Solar Density	0.830	-0.458	0.363	1.555	1.605	-0.875	1.559	2.181	-1.428	-3.297	-0.543	-1.035
	(3.099)	(3.260)	(2.652)	(2.653)	(1.433)	(2.931)	(1.507)	(1.654)	(2.926)	(3.412)	(2.818)	(3.044)
Wind Potential	1.211***	0.895**	0.999***	0.807**	-0.812*	-0.469	-0.651*	-1.006***	0.372**	0.363**	0.336**	0.139
	(0.382)	(0.361)	(0.308)	(0.333)	(0.477)	(0.442)	(0.361)	(0.335)	(0.148)	(0.155)	(0.152)	(0.145)
Solar * GSPPC	-103.3	-36.32	-65.42	-56.63	-7.311	64.70	16.91	42.78	1.851	60.07	-32.49	-23.03
	(85.69)	(102.0)	(86.15)	(75.48)	(42.74)	(84.06)	(48.70)	(47.42)	(85.06)	(103.0)	(82.61)	(92.29)
WindPot * GSPPC	-43.02***	-36.48***	-36.22***	-23.88***	14.28*	6.483	11.64*	19.75***	-9.822***	-10.48***	-8.640***	-3.138
	(10.60)	(7.906)	(7.260)	(5.856)	(8.450)	(8.396)	(6.588)	(6.511)	(2.381)	(2.820)	(2.254)	(2.313)
BiomassPC	-64.11	195.2	-117.9	-54.44	60.08	162.4	26.17	25.19	60.71	115.7	28.55	2.493
	(191.0)	(329.4)	(232.3)	(398.6)	(164.6)	(193.5)	(185.7)	(134.2)	(195.9)	(216.4)	(188.8)	(174.2)
HouseVote	13.58***	15.32***	13.83***	15.70***	16.22	9.129*	11.06**	15.80*	-3.467	-6.168	-6.621	-1.993
	(4.704)	(4.489)	(4.823)	(5.441)	(11.28)	(4.873)	(5.447)	(9.558)	(6.417)	(7.314)	(6.585)	(5.842)
CritIndex	7.758***	7.855***	6.227**	6.816**	4.269*	3.510	5.382**	6.329**	-0.144	-4.319	-1.550	-0.821
	(1.967)	(2.431)	(2.546)	(3.347)	(2.197)	(2.219)	(2.285)	(3.152)	(1.735)	(3.067)	(2.523)	(3.521)
EnergyProdPC	0.000490	0.000479	0.000427	0.000383	-0.000831	0.000113	-0.000471	-0.000208	8.56e-06	-8.44e-05	-4.88e-05	-0.000135
	(0.000492)	(0.000588)	(0.000617)	(0.000630)	(0.00164)	(0.000278)	(0.00185)	(0.000454)	(0.000139)	(0.000173)	(0.000164)	(0.000164)
ElectricPrice	0.693***	0.275	0.343*	0.261	-0.0514	-0.287	-0.428*	-0.727**	0.364**	0.424**	0.342**	0.361**
	(0.200)	(0.209)	(0.201)	(0.194)	(0.219)	(0.204)	(0.228)	(0.313)	(0.152)	(0.197)	(0.172)	(0.178)
ConsumptionPC	-3.299	-6.044	-10.74	-11.75	-2.740	-2.772	-3.280	-5.848	1.759	-1.327	1.665	-0.700
	(9.923)	(15.77)	(16.11)	(15.93)	(7.059)	(6.205)	(6.725)	(4.313)	(1.656)	(1.898)	(1.671)	(2.412)
CO2Intensity	-3.845**	-2.875*	-1.950	-2.150	-0.776	-2.772	-2.825	-2.626	0.230	1.093	0.508	1.336
	(1.731)	(1.541)	(1.622)	(1.605)	(2.168)	(1.992)	(2.342)	(2.443)	(0.805)	(0.879)	(0.919)	(0.985)
Liberalism	0.0913**	0.133***	0.127***	0.142***	0.0945**	0.0794**	0.0804*	0.0682	-0.0149	-0.0423	-0.0235	-0.0526**
	(0.0365)	(0.0294)	(0.0357)	(0.0380)	(0.0412)	(0.0382)	(0.0454)	(0.0428)	(0.0205)	(0.0271)	(0.0256)	(0.0262)
SierraPC	-100.8	-575.0	-289.9	-391.1	12.66	39.40	26.87	15.05	781.8***	1,220***	1,020***	910.5***
	(131.8)	(447.6)	(474.0)	(468.4)	(32.59)	(32.61)	(33.45)	(30.83)	(263.1)	(302.8)	(271.9)	(304.0)
StateRevenuePC	1.633***	1.571***	1.508***	1.511***	-0.243	0.0338	0.0906	0.0116	0.186	0.192	0.230	0.258
	(0.224)	(0.211)	(0.231)	(0.207)	(0.187)	(0.257)	(0.270)	(0.289)	(0.151)	(0.225)	(0.183)	(0.207)

GSPPC	333.7	205.7	315.4	312.6	56.14	-242.8	-56.74	-154.4	80.57	-84.17	229.1	165.0
	(336.2)	(403.7)	(327.3)	(331.7)	(199.1)	(352.7)	(231.5)	(225.4)	(342.3)	(421.0)	(342.7)	(373.1)
PopDens	0.00139	-0.00151	-0.00392	-0.00608	-0.000409	-0.000159	-4.80e-05	0.000884	-0.00559*	-0.00923**	-0.00756*	-0.00569
	(0.00523)	(0.00729)	(0.00942)	(0.00975)	(0.00413)	(0.00582)	(0.00602)	(0.00937)	(0.00325)	(0.00401)	(0.00419)	(0.00428)
LandSqKM	2.77e-05***	2.63e-05**	2.70e-05**	2.21e-05	-1.75e-06	-3.66e-06	-1.72e-06	-4.31e-06	-4.52e-06	-3.83e-06	-5.39e-06	-6.46e-06
	(1.04e-05)	(1.28e-05)	(1.36e-05)	(1.39e-05)	(1.06e-05)	(9.81e-06)	(9.01e-06)	(1.03e-05)	(6.24e-06)	(7.80e-06)	(7.86e-06)	(9.15e-06)
EastGrid	1.546	0.244	0.0966	-0.261	-11.32*	-11.16*	-10.06*	-12.58**	3.606***	5.153***	4.235***	5.035***
	(2.713)	(2.642)	(2.546)	(2.469)	(6.140)	(5.849)	(5.584)	(6.257)	(0.873)	(1.213)	(0.927)	(1.101)
WestGrid	0.218	-0.313	-1.015	-0.794	-11.19**	-12.09**	-11.07**	-13.80**	3.358***	3.534**	3.824***	4.935***
	(2.113)	(2.179)	(1.985)	(2.267)	(4.948)	(5.099)	(4.739)	(5.619)	(1.177)	(1.529)	(1.442)	(1.682)
ISONE	3.527**	-0.150	0.968	2.503	-3.441**	-3.907**	-3.572*	-0.756	-2.264	-4.830***	-3.508**	-3.696*
	(1.556)	(2.648)	(3.119)	(2.986)	(1.346)	(1.669)	(1.838)	(2.187)	(1.414)	(1.639)	(1.544)	(2.004)
PJM	3.525**	2.194	3.639**	3.426	-0.431	-0.571	-0.114	0.248	-0.103	-0.566	-0.162	-0.511
	(1.462)	(1.810)	(1.660)	(2.519)	(1.024)	(1.106)	(1.055)	(1.188)	(0.999)	(1.101)	(0.952)	(1.172)
SPP					1.988	2.362	1.441	0.100	0.149	0.741	0.0600	-0.563
					(1.667)	(1.782)	(1.526)	(1.364)	(1.401)	(1.740)	(1.362)	(1.173)
MISO	2.904**	-0.653	2.514**	0.938	-0.125	-0.688	0.892	2.038	0.699	-0.443	0.314	0.368
	(1.240)	(1.420)	(1.229)	(1.651)	(1.257)	(1.228)	(1.006)	(1.306)	(0.886)	(0.964)	(0.822)	(0.896)
Restructure	0.201	0.520	0.228	0.490	-0.131	-0.0157	-0.124	-0.106	0.218	-0.110	0.223	0.199
	(0.623)	(0.557)	(0.717)	(0.632)	(0.444)	(0.417)	(0.412)	(0.488)	(0.388)	(0.340)	(0.467)	(0.448)
Time	0.407	0.0707	0.0729	-0.0521	0.300***	-0.0272	-0.0527	-0.0469	0.154	-0.367**	-0.109	-0.137
	(0.257)	(0.262)	(0.273)	(0.268)	(0.0886)	(0.0910)	(0.0982)	(0.106)	(0.0994)	(0.163)	(0.147)	(0.130)
Constant	-35.98**	-28.80*	-30.81**	-35.50***	-8.053	9.025	-1.995	-0.529	-6.574	1.265	-9.340	-7.516
	(15.56)	(16.78)	(12.74)	(13.50)	(12.63)	(16.67)	(12.22)	(11.87)	(10.98)	(13.85)	(10.49)	(11.75)
Obs,	666	632	666	666	725	674	725	725	725	674	725	725
pR^2	0.764	0.808	0.803	0.824	0.490	0.556	0.551	0.624	0.416	0.501	0.451	0.531
X^2	214.1	298.0	435.3	559.8	271.9	.	272.0	.	181.9	283.4	187.5	212.0

p-value: * < .1; ** < .05; *** < .01

Table 6. Non-Competitive Energy Policies – Personal Tax Incentives: Random Effects Logistic Regression Results, Robust Standard Errors in Parentheses, Clustered by State

	Pers Renew NN	Pers Renew Walker	Pers Renew Census	Pers Renew Subregion	Pers Tax Eff NN	Pers Tax Eff Walker	Pers Tax Eff Census	Pers Tax Eff Subregion
Diffusion Variable	-4.795**	14.17***	10.91***	12.12***	-13.40***	19.58***	13.62**	17.48***
	(2.004)	(1.962)	(3.220)	(2.761)	(4.339)	(3.694)	(5.423)	(5.269)
Solar Density	2.101	-1.543	3.308**	5.022***	-2.987	4.967	2.633	4.672*
	(1.420)	(2.487)	(1.424)	(1.834)	(2.929)	(3.236)	(2.105)	(2.726)
Wind Potential	-0.227	-0.235	-0.249	-0.153	-0.120	-0.141	-0.000708	0.207
	(0.172)	(0.246)	(0.220)	(0.215)	(0.349)	(0.138)	(0.219)	(0.257)
Solar * GSPPC	-12.95	81.40	-39.61	-92.16	-28.70	-147.8	-90.83	-164.0*
	(53.98)	(82.14)	(46.91)	(56.56)	(88.36)	(110.8)	(75.90)	(91.43)
WindPot * GSPPC	4.882	5.401	5.645	2.784	1.840	1.896	-1.120	-8.072
	(3.854)	(4.983)	(4.478)	(4.463)	(11.00)	(2.332)	(3.835)	(6.818)
BiomassPC	101.3	-41.60	96.21	61.84	-177.7	224.6	88.35	75.10
	(157.3)	(148.2)	(146.0)	(147.7)	(554.2)	(200.3)	(346.5)	(320.3)
HouseVote	10.69**	13.58***	11.10**	7.533	1.991	4.017	6.615	5.569
	(5.297)	(5.128)	(4.700)	(5.818)	(9.386)	(6.278)	(5.446)	(9.098)
CritIndex	3.285	4.529	6.277**	6.805*	-2.058	-0.502	-1.299	-1.935
	(3.696)	(3.230)	(2.967)	(3.648)	(4.294)	(3.767)	(2.792)	(3.281)
EnergyProdPC	-0.00151	-0.00181	-0.00151	-0.00277	0.000676	0.000418	0.000657*	0.000837**
	(0.00185)	(0.00188)	(0.00188)	(0.00199)	(0.000430)	(0.000366)	(0.000356)	(0.000384)
ElectricPrice	-0.124	-0.149	-0.278*	-0.296	-0.595*	-0.182	-0.396*	-0.460**
	(0.146)	(0.164)	(0.153)	(0.199)	(0.313)	(0.227)	(0.215)	(0.198)
ConsumptionPC	-7.173**	-6.159**	-5.046	-2.127	-22.14*	-8.720	-14.29	-8.065
	(3.007)	(2.896)	(3.298)	(5.514)	(12.93)	(8.853)	(9.200)	(10.28)
CO2Intensity	3.210*	4.439**	2.699	3.421	-0.617	-4.181	-3.608	-6.359
	(1.903)	(2.153)	(2.186)	(2.249)	(1.906)	(2.681)	(3.162)	(4.455)
Liberalism	0.0575**	0.00719	0.0630**	0.0816***	0.0445*	0.0144	0.0371	0.0538
	(0.0264)	(0.0330)	(0.0284)	(0.0266)	(0.0263)	(0.0422)	(0.0372)	(0.0369)
SierraPC	-421.5	-27.43	-467.7	-304.4	-881.7**	-796.9***	-926.0***	-550.4
	(273.2)	(243.0)	(287.3)	(262.3)	(433.1)	(305.7)	(331.9)	(385.7)
StateRevenuePC	-0.0208	0.324	0.290	0.268	-0.369	0.282	0.0523	-0.138
	(0.167)	(0.219)	(0.199)	(0.191)	(0.229)	(0.262)	(0.206)	(0.188)
GSPPC	77.74	-309.7	163.6	369.5	18.80	494.7	243.2	556.5

	(203.8)	(325.5)	(191.1)	(235.9)	(390.7)	(431.3)	(313.4)	(375.0)
PopDens	0.0120**	0.0137**	0.00853*	0.00923*	0.0120*	0.00776	0.00582	0.00487
	(0.00596)	(0.00538)	(0.00503)	(0.00526)	(0.00630)	(0.00659)	(0.00672)	(0.00683)
LandSqKM	-1.02e-05	-1.05e-05	-8.92e-06	-6.62e-06	8.92e-07	9.23e-06	5.64e-06	6.54e-06
	(6.18e-06)	(6.78e-06)	(5.79e-06)	(5.68e-06)	(9.84e-06)	(9.16e-06)	(6.84e-06)	(6.91e-06)
EastGrid	-4.627**	-3.252*	-3.841**	-4.540**	-6.490**	-0.440	-2.306	-2.095
	(2.094)	(1.975)	(1.867)	(1.842)	(3.230)	(2.423)	(2.000)	(2.030)
WestGrid	-2.536	-3.274*	-3.693**	-4.264**	1.899	1.081	0.0270	-0.502
	(2.084)	(1.802)	(1.876)	(1.891)	(2.730)	(2.113)	(1.717)	(1.755)
ISONE	-3.167**	-5.936***	-3.343**	-2.996*	3.565	-0.126	1.017	0.698
	(1.318)	(1.497)	(1.516)	(1.780)	(2.725)	(1.596)	(1.617)	(1.798)
PJM	-4.892***	-5.930***	-4.473**	-4.966**	-1.248	1.019	1.185	0.128
	(1.740)	(2.093)	(2.162)	(2.526)	(1.452)	(1.755)	(1.375)	(2.010)
SPP					5.315*	2.373*	2.851	3.893**
					(2.809)	(1.422)	(1.914)	(1.907)
MISO	-2.736**	-1.032	-0.567	-0.358	-4.364**	-2.684**	-1.631	-1.850
	(1.207)	(1.064)	(1.107)	(1.221)	(1.953)	(1.080)	(1.236)	(1.349)
Restructure	-0.570	-0.856	-0.862*	-0.698	-0.364	-1.176	-1.643**	-2.109**
	(0.421)	(0.552)	(0.501)	(0.464)	(0.547)	(0.762)	(0.704)	(0.851)
Time	0.297*	-0.110	0.0200	0.0660	0.644***	-0.0689	0.219	0.191
	(0.158)	(0.128)	(0.120)	(0.115)	(0.135)	(0.188)	(0.173)	(0.163)
Constant	-11.96	1.526	-17.90**	-26.57**	24.28*	-18.55	-4.895	-14.48
	(8.594)	(13.23)	(8.179)	(10.46)	(12.87)	(12.58)	(9.798)	(13.05)
Obs,	666	632	666	666	725	674	725	725
pR^2	0.367	0.412	0.331	0.404	0.548	0.520	0.430	0.511
X^2	146.1	159.0	135.1	81.77	1351	498.3	318.1	317.2

Table 7. Diffusion variables; without controlling for internal determinants

	High-competition Policies			Low-competition Policies				
	RPS	Corporate Efficiency	Corporate Renewable	Public Benefit	Net meter	Building Standards	Personal Tax Renewable	Personal Tax Efficiency
Neighbor	4.720***	-1.032	-1.032	5.285***	2.822***	3.340***	0.404	.3
Walker	6.462***	5.994***	3.937***	5.382***	5.075***	5.311***	8.9***	7.696***

p-value: * < .1; ** < .05; *** < .01

Appendix A: Selected Policy Examples

Policy	Policy Description	Example State Legislati each policy a selection randomly selected state provided)
Renewable Portfolio Standards	Requires utilities, usually serving a minimum population, to generate or purchase enough renewable energy to supply a percentage of their electric sales	Connecticut Requires each electric s and each electric distrib company wholesale sup to obtain at least 23% o retail load by using rene energy by Jan 1, 2020. RPS also requires each supplier and each electr distribution company wholesale supplier to ol least 4% of its retail loa using combined heat an power systems and ener efficiency by 2010
Business and corporate tax credits (renewable)	Financial incentives for eligible renewable and other technologies installed and placed into service	Hawaii The Hawaii Energy Tax Credits allow corporatio claim an income tax cre 20% of the cost of equi and installation of a wi system and 35% of the equipment and installat solar thermal or photov (PV) system
Business and corporate tax credits (efficiency)	Financial incentives for certain energy-efficient equipment installed and placed into service	Georgia The following credit lin various technologies: Lighting retrofit project $0.60 / square foot of b Energy-efficient produc $1.80 / square foot of b

Public benefit funds	Collects public funds, for example using a public goods surcharge on ratepayer electricity, to create public funds for renewable energy and energy efficiency projects	Oregon Requires energy utilities to collect a 3% public-purpose charge from their customers to support renewable energy and energy efficiency projects
Energy standard for public buildings	Promote energy conservation in state-owned buildings	Alabama State departments and agencies are encouraged and promoted to conserve energy in state-owned buildings. The initiative aims to reduce energy consumption by 10% in all conditioned, state-owned facilities by the end of Fiscal Year 2008, and 20% by Fiscal Year 2010 (as compared to 2005 levels). State departments and agencies are encouraged to employ the latest energy-conservation practices in the design, construction, renovation, operation, and maintenance of state facilities
Personal tax credits (renewable)	Incentives for residential consumers to install and implement renewable energy systems	Utah The individual income tax credit for residential systems is 25% of the reasonable installed system costs up to a maximum credit of $2,000 per residential unit. Eligible residential systems include active and passive solar thermal systems; solar electric systems; wind turbines; hydro energy; geothermal heat pumps direct-use geothermal; and biomass

Personal tax credits (efficiency)	Incentives for residential consumers to purchase and install energy-efficient products	Virginia The incentive is available for dishwashers, clothes washers, air conditioners, ceiling fans, compact fluorescent light bulbs, dehumidifiers, programmable thermostats or refrigerators that meet or exceed federal Energy Star standards. For taxable years beginning in 2007, individuals may claim a deduction of 20%, up to $500, on their state income tax return for sales tax paid to purchase certain energy-efficient products
Net metering	Incentives consumers to implement on-site renewable energy generation	Minnesota Each utility must compensate customers for customer net excess generation (NEG) at the average retail utility energy rate defined as the total annual class revenue from sales of electricity minus the annual revenue resulting from fixed charges, divided by the annual class kilowatt-hour sales
Energy standards for public buildings	Promotes the reduction of energy use in public buildings	Iowa In April 2005, Iowa governor issued an executive order directing state agencies to reduce electricity and natural gas use in buildings by an average of 15% by 2010, relative to their energy use in 2000

Source: Database of State Incentives for Renewables & Efficiency 2012 (www.dsireusa.org)

Appendix B: Adoption of Energy Policies by state

	RPS	Personal tax (Renew)	Personal Tax (Efficiency)	Public benefit fund	Building standards	Net meter	Corporate tax credit (Efficiency)	Corporate tax credit (Renewable)
Alabama					2006			
Alaska								
Arizona	2006	1994			1998	2008	2006	
Arkansas					2005	2001		
California	2002			1996	2005	1995		
Colorado	2004				2005	2005		
Connecticut	1998			1998	2006	1998		
Delaware	2005			1999	2004	1999		
Florida					2007	2008	2006	
Georgia		2008				2001	2008	2008
Hawaii	2004				2006	2004		
Idaho		2005			2008			
Illinois	2007			1997	2005	2007		
Indiana					2008	2004		
Iowa		2005			2005		2005	
Kansas								
Kentucky					2008	2005		2008
Louisiana		2007			2007	2003	2007	
Maine	2006			1997	2003	1998		
Maryland	2004	2000			1992	1997	2000	2001
Massachusetts	1997			1997	2007	2008		
Michigan	2008			2000	2008	2008		
Minnesota	2001				2001			
Mississippi								
Missouri	2008		2008		1993	2007	1997	
Montana	2005	2001		1999		1999	2001	2004
Nebraska								
Nevada	2005					1997		
New Hampshire	2007			2002	2005	1998		
New Jersey	1999			1999	2002	1999		
New Mexico	2006	2006		2005	2006	2008	2002	2007
New York	2004	1997		1996	2001	1998	2001	2000
North Carolina	2008				2007	2005		
North Dakota		2001				1991	2001	
Ohio				1999	2007	1999		
Oklahoma					2008		2002	
Oregon	2007	2007		1999	1991	1999		
Pennsylvania	2004			1996	2004	2004		
Rhode Island	2004	2006		1996	2005	2006	2006	
South Carolina		2006					2006	

South Dakota							
Tennessee							
Texas	1999				1995		
Utah		2001			2006	2002	2001
Vermont	2005	2008		1999		1998	2008
Virginia					2007	1999	
Washington	2007				2005	1998	
West Virginia						2006	2001
Wisconsin	1998			1999	2006	1992	
Wyoming						2001	