The Diffusion of Representation: How Interdependence Influences Policy Responsiveness in the American States

Desmond D. Wallace

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Abstract

Do policy decisions in one state influence policy responsiveness in other states? I argue that not only are state policy outputs a function of other states' policy choices but incorporating said choices affect public opinion's influence on policy decisions. Specifically, the inclusion of policy interdependence yields two types of policy responsiveness. Intrastate policy responsiveness involves elected officials responding to public opinion within their state. Interstate policy responsiveness involves elected officials responding to public opinion outside their state. Using a Multi-parametric Spatio-Temporal Autoregressive (m-STAR) model, I analyze state-level data from the period 1960-2014. I find that inclusion of other states' policy decisions lead to different levels of policy responsiveness across the states.

Introduction

Do policy decisions in one state influence policy responsiveness in other states? While complex, one could succinctly surmise that policy changes are the result of problems, policies, and politics (Kingdon 1995; Zahariadis 2014). In addition to these factors there exists a fourth influence of policy change, one that is important in a democratic society: people. Specifically, elected officials should move policy in the direction supported by their constituents. Although responding to constituents' preferences is not a sufficient condition to a democratic society (Dahl 1989), policy change must be a function of constituent preferences for the electorate to exercise electoral control over their elected government. This type of representation, policy responsiveness, is a frequent topic of exploration by political scientists in national (Erikson, MacKuen, and Stimson 2002; Miller and Stokes 1963; Wlezien 1995), sub-national (Caughey and Warshaw 2018; Erikson, Wright, and McIver 1993; Lax and Phillips 2009), and international contexts (Powell 2004; Soroka and Wlezien 2010). These studies demonstrate that not only does a relationship between public opinion and public policy exists, but it is also a healthy relationship.

Despite the proliferation of policy responsiveness research, one area that has received little attention from scholars is whether the actions of elected officials and their constituents influence how responsive elected officials in other jurisdictions are to their constituents (Manza and Cook 2002). If politicians are influencing politicians in other jurisdictions and this interdependence is not accounted for both theoretically and empirically then scholars fail to capture fully the politician-constituent relationship that is important in a democratic society while increasing the likelihood that estimates of responsiveness are likely to be biased. In other

words, politicians may be more or less responsive to their constituents than suggested by the literature.

This paper examines whether accounting for this interdependence influences the effect public opinion has on policy output in the American states. I argue that incorporating policy interdependence into the opinion-policy relationship leads to two types of responsiveness. The first type is intrastate responsiveness, where a state government's actions respond to the opinions of individuals inside said government's state. The second type is interstate responsiveness, where a state government's action is responsive to the views of individuals inside another state. The result is an indrect way for lawmakers in one state to respond to public opinion in another state. To test this argument, I utilize spatial econometrics to capture the interdependent relationship between policymakers. Spatial econometrics has played a significant role in studies focusing on the spread of policies across states (Case, Rosen, and Hines 1993), as well as comparative and international political economy (Franzese and Hays 2008; Hays, Kachi, and Franzese 2010). However, scholars have not yet applied this method in policy responsiveness research.

I make two contributions in this paper. First, I present a needed refinement to scholars' understanding of policy responsiveness. I find that changes in public opinion in one state not only yield policy shifts in the same state but also lead to policy changes in other states. I also contribute to the diffusion literature. Gilardi (2016) argues that scholars should use the insights from diffusion literature to improve our understanding of other phenomena. I do just this by combining the diffusion and responsiveness literatures to enhance beliefs about representation and responsiveness. Second, I introduce new methods to the study of representation. Existing representation research only focuses on the influence public opinion has on policy outputs, without accounting for interdependence between states. I account for this dependence via a

general-to-specific modeling strategy via the Multi-parametric Spatio-Temporal Autoregressive (m-STAR) model (Hays, Kachi, and Franzese 2010). Using this method allows me to identify and distinguish multiple definitions of interdependence.

The remainder of this paper proceeds as follows. First, I outline a theoretical framework of how interdependence can influence responsiveness and discuss the method of choice, the m-STAR model. I will then present my results, demonstrating that policy interdependence does influence how changes in mass policy liberalism (public opinion) in one state yields changes to policy liberalism (policy output) in other states. I conclude with a discussion of the implications of the empirical analysis, and future directions for this research.

Interdependent Responsiveness Framework

My theoretical framework builds on existing studies of responsiveness and representation (Achen 1978; Caughey and Warshaw 2018; Dahl 1956; Pitkin 1967). Similar to previous work, I assume that for any policy area, ideological variation is a single dimension continuum. I further assume the government will pursue and implement liberal policy when the public prefers liberal policy. Contrarily, if the people prefer conservative policy, the government will seek and implement conservative policy. Governments responding to their constituents can involve voters electing individuals who will then implement their policy preferences (Erikson, Wright, and McIver 1993; Soroka and Wlezien 2010) or elected officials adapting to their constituents' preferences (Gerber 1996; Snyder Jr. and Ting 2003).

This second assumption, however, does have limitations. For example, government being responsive to its constituents does not mean that said government's policies are congruent with their constituents' preferences. In other words, just because the public may prefer a specific policy, does not mean the government will implement said exact policy. The literature

establishes a clear distinction between congruence (how close is policy output to constituents' preferences) and responsiveness (how constituents' preferences influences policy output) (Beyer and Hänni 2018; Matsusaka 2015). As Caughey and Warshaw (2018) note, various factors can influence the policymaking process, such as available government resources or unequal citizen influence on policy outcomes. These factors can result in policy that does not match the preferences of the average constituent.

An additional limitation imposed is that responsiveness is not proportionate. In other words, the government can pursue and implement a set of policies that are less in scope compared to their constituents' preferences. Alternatively, the government can pursue and implement a set of policies that are greater in scope compared to their constituents' preferences (Caughey and Warshaw 2018). The main expectation from these assumptions is that if public opinion moves in a certain direction, public policy will move in the same direction, but not necessarily at the same rate as public opinion.

Assuming Interdependence

While policy responsiveness presumes a government's decision to adopt policy is primarily a function of their constituents' preferences, there is an additional implicit assumption: the influence of constituent preferences is independent and homogeneous across all units. In other words, not only is the influence public opinion has on policy output in one state the same as in another state, the opinion-policy relationship in one state is not affected by changes in either opinions or policies in other states. Here, I replace this implicit independence assumption with an explicit interdependence assumption. Specifically, I argue that a state's policy output is not only a function of in-state constituent preferences but also of the policy outputs from neighboring states.

Existing research demonstrates that policy interdependence is a substantively important point of consideration. One of the ways the literature defines policy interdependence is in the context of policy diffusion (Gilardi 2014). According to Simmons, Dobbin, and Garrett (2006), policy diffusion occurs "when government policy decisions in a given country are systematically conditioned by prior policy choices made in other countries" (p. 787). A government's policy decisions can influence policymaking in other states in numerous ways including policymakers learning, imitating, or competing with one another (F. S. Berry and Berry 2014; W. D. Berry and Baybeck 2005; Shipan and Volden 2008). Research shows that policy adoptions in one state can also influence public opinion in neighboring states. Governments in these neighboring states then respond to the shifts in public opinion (Pacheco and Maltby 2017; Pacheco 2012).

Interdependent Responsiveness

The inclusion of policy interdependence marks a significant departure from existing responsiveness studies. By including policy interdependence, one can partition a government's total responsiveness into two types. The first type of responsiveness involves the constituency residing in the state under a government's jurisdiction. Here, I refer to a government responding to public opinion within its state as intrastate responsiveness. Intrastate responsiveness is the type of responsiveness scholars focused on in existing responsiveness studies.

The presence of policy interdependence can positively influence intrastate responsiveness. For example, the government in one state could use public opinion outside of its state, as well as other governments' responses to said outside public opinion, as a heuristic to respond to public opinion in its state. Thus, the government becomes more responsive to public opinion in its state. Alternatively, policy interdependence can negatively influence intrastate responsiveness. For example, lawmakers have competing groups looking for responses to their

preferences. Thus, the more lawmakers respond to public opinion out-of-state, the less likely they are to respond to public opinion in-state, particularly if the two types of opinion conflict. Thus, the first hypothesis is the following:

Hypothesis 1: Intrastate responsiveness will be different in the presence of policy interdependence compared to intrastate responsiveness absent interdependence.

The second type of responsiveness involves the constituency residing outside of the state. Under this framework, I refer to a government responding to public opinion outside of its state as interstate responsiveness. Interstate responsiveness is the type of responsiveness one would observe when accounting for policy interdependence between states.

Because policy interdependence can have either a positive direction or a negative relationship with responsiveness, interstate responsiveness can be either positive or negative. If states have a positive policy interdependent relationship, then similar states will make the same policy decisions while different states will form different policy decisions. For example, suppose a state, state A, is considering whether to increase their minimum wage. If policy interdependence between two states is positive, then if neighboring state B increases their minimum wage, then state A will also raise its minimum wage. The result of this policy decision is two-fold. First, state A increasing its minimum wage correlates with public support for the decision in its state. Second, state A's decision also correlates with public support in neighboring state B.

However, it could be the case that states have a negative policy interdependent relationship. If so, then different states will make similar policy decisions while similar states will make different policy decisions. For example, suppose a state, state C, is considering imposing additional environmental regulations on businesses, and these proposed regulations

have public support. If there exists a negative policy interdependent relationship, then if neighboring state B adopts a set of regulations, then state A will adopt regulations such that the public in state A supports them. However, the public in state B will not be supportive of state A's decision. In other words, state A's policy decision positively correlates with public preferences in its state. Conversely, state A's policy decision negative correlates with public preferences in state B.

To summarize, the presence of policy interdependence leads to a linkage between public opinion in one state and policy output in another state. For the purposes of this paper, I argue that this relationship is primarily the byproduct of policy interdependence taking place between states. In other words, lawmakers are not actively trying to be responsive to public opinion in another state. Instead, their policy decisions are a function of both public opinion in their own state, as well as policy decisions originating in other states, which in turn are functions of public opinion in their own state. Thus, the second hypothesis is the following:

Hypothesis 2: As public opinion changes in one state, there will be a significant change in policy output in another state.

Finally, I make two assumptions concerning the temporal nature of responsiveness. First, a government's response to public opinion shifts, in- or out-of-state, is not instantaneous. I assume that it takes a government at least one period to respond to their constituents' preferences. As Caughey and Warshaw (2018) explain, this assumption acknowledges the barriers elected officials experience when making policy (e.g., veto players, incrementalism), and that these barriers make it easier for the status quo to prevail.

The second assumption is that policy is a function of not only in-state and out-of-state public preferences but also previous iterations of said policy. This assumption accounts for

extensive periods of stasis that defines most policies (Baumgartner and Jones 1993). By considering for earlier iterations of policy, policymakers' ability to move policy in the direction of constituent preference will occur incrementally over time. In other words, a shock in public opinion will accumulate into large changes in overall policy output as states modify policy in different areas over time. These policy changes will eventually either accelerate (decelerate) the rate of responsiveness in the presence of positive (negative) interdependence. Thus, the third hypothesis is the following:

Hypothesis 3: States' response to a public opinion shock will result in negligible policy changes (weaker responsiveness) instantaneously and substantial policy changes (stronger responsiveness) overall.

Methodology

Gilardi (2014) identified two empirical approaches for treating interdependence as a phenomenon of interest. One method features the inclusion of spatial lags as exogenous parameters of an econometric model. This method has two advantages. The first is that the researcher can measure the nature and presence of interdependence. The second advantage is that spatial modeling offers a convenient way of capturing interdependence with respect to time-series cross-sectional datasets (Gilardi 2014).

One of the most significant issues when utilizing spatial econometrics involves specification of the spatial weights matrix. The goal of the spatial weights matrix is to capture *a priori* all possible spatial relationships among the units. Usually, researchers operationalize spatial relationships in the context of physical geography (Gilardi 2016; Neumayer and Plümper 2016). However, like Beck, Gleditsch, and Beardsley (2006) eloquently remind us: "space is more than geography." In other words, one can operationalize the spatial weights matrix in non-

geographical contexts as well. The inclusion of non-geographic spatial weights leads to the possibility that the proper operationalization of the spatial relationships between the analyzed units is one that involves multiple, or multi-dimensional, spatial connections. Furthermore, each spatial connection potentially represents a different mechanism responsible for the presence of spatial dynamics.

Neumayer and Plümper (2016) recommend several approaches for handling multiple spatial connectivities. One method involves including numerous spatial lag variables, with each variable capturing a different spatial relationship. Thus, the spatial econometric model I plan to utilize is the m-STAR model (Hays, Kachi, and Franzese 2010). The m-STAR model takes the following matrix form:

$$y = Wy + \phi My + X\beta + \varepsilon$$

$$W \equiv \sum_{r=1}^{R} \rho_r W_r$$

For equation 1a, y represents the dependent variable as a $NT \times 1$ vector of observations. The term M represents a matrix that is size $NT \times NT$ with the value one occupying the minor diagonal; thus, a one is located at the coordinates $(N + 1, 1), (N + 2, 2), \cdots, (NT, NT - N)$, with zeros occupying the remaining elements of the matrix. Multiplying this matrix with the dependent variable results in a first-order temporal lag, My. The term ϕ represents the temporal autoregressive coefficient associated with My. X is a $NT \times K$ matrix of observations on K variables, while β is a $K \times 1$ vector of coefficients on X. The term ε is a $NT \times 1$ vector that features the stochastic components, assumed independently, and identically distributed (*i.i.d*).

Equation 1b represents the summation of the included spatial weights matrices. Each spatial weights matrix, W_r, represents the relative connectivity from state j to state i. Thus, each

spatial lag term, $\boldsymbol{W_r y}$, is a weighted sum of state j's outcomes, or y. Each spatial weights matrix is a $NT \times NT$ block-diagonal matrix. Each block in the diagonal represents each year observed in the complete dataset. Finally, the term $\boldsymbol{\rho_r}$ represents the spatial autoregression coefficient that corresponds with each spatial weights matrix. Because the term $\boldsymbol{W}$ represents multiple ties the actors of interest could have, the m-STAR model incorporates both the actors' network ties and behavior. Thus, the m-STAR model accounts both possible contagion and selection sources of spatial interdependence (Hays, Kachi, and Franzese 2010).

The value of ρ in a spatial lag-type model can take on either a positive value or a negative value. If ρ is positive, there is evidence of negative externalities, and the actors have a strategic compliments relationship. In a strategic compliments relationship, actors respond to other actors' actions by performing the same action. Simply put, for every action, there is similar action in kind. If ρ is negative, there is evidence of positive externalities, and the actors have a strategic substitutes relationship. In a strategic substitutes relationship, actors will respond to other actors' actions with opposing response actions. In other words, for every action, there is an opposite action (Franzese and Hays 2008).

Data

The dependent variables of interest represent states' policy actions across multiple policy areas. To capture policy actions across multiple areas, I rely on Caughey and Warshaw's (2016, 2018) state policy liberalism measures, which captures the ideological orientation of a state's policies. Caughey and Warshaw use Bayesian factor analysis on continuous and ordinal data to construct this measure from numerous politically salient policies, for which at least five years of data were available. In addition to estimating a policy liberalism measure incorporating all policy domains, they also estimated policy liberalism scores for the economic and social policy

domains. The economic policy liberalism score is the product of numerous economic policy areas, such as social welfare, taxation, labor, and the environment. The social policy liberalism score is the product of multiple social policy areas, such as women's rights, morality legislation, family planning, religion, criminal justice, and drugs (Caughey and Warshaw 2016, 2018). Each state has an economic and social policy liberalism score for each year, covering the period 1936 – 2014. Higher policy liberalism scores indicate that a state has more ideologically liberal policy outputs. Lower policy liberalism scores indicate a state has more ideologically conservative policy outputs.[1]

Independent Variables

To test my hypotheses, I rely on two types of independent variables. The first is spatial lag variables[2], representing similarity between the states. I consider three types of similarity: geographic, political, and economic. I include geographic and political similarity because most diffusion studies included measures of geographic proximity and joint membership (Gilardi 2016). I add economic similarity under the assumption that states with similar economies will make the same policy decisions. The second type of independent variable is state-level public opinion measures.

Spatial Lags

The first spatial lag represents geographic similarity among the states. I operationalize this in two ways. The first is whether two states share at least one common border point. The spatial weights matrix element takes on the value one if two states share at least one geographic

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[1] See Caughey and Warshaw (2016, 2018) for a more detailed explanation about the creation of their policy liberalism and mass policy liberalism measures.

[2] I normalize each spatial weights matrix with the following procedure. First, I calculate the row and column totals for each matrix. Then, I identify the maximum row and column totals. Finally, I divide each matrix element by the minimum of these two values.

border point and zero otherwise. The second way I operationalize geographic similarity is inverse geographic distance. Here, I calculate the Euclidean distance between two states' centroids and take the inverse of said distance.

The second spatial lag represents political similarity among the states. I operationalize political similarity as whether two states have governments with similar political compositions. To calculate this measure, I first create a composite index based on whether a state's governor is a Democrat, a Republican, or a third party/Independent, and whether a state's legislative chamber(s) are controlled by Democrats, Republicans, or have split control. The minimum of this index is zero, representing total Republican control, while the maximum is one, representing total Democratic control. I then calculate the Euclidean distance between states' government partisan index, with the spatial weights matrix featuring the inverse of these distances. To create this, I rely on data on the governors' party affiliation and state legislative control compiled by Klarner (2013).[3] An alternative operationalization I utilize for political similarity involves calculating the inverse Euclidean distance between two state governments' ideology score (W. D. Berry et al. 2010).

The third and final spatial lag represents economic similarity among states. I first operationalize economic similarity as the inverse distance between states' gross state product (GSP) per capita. To calculate this measure, I use data from the Bureau of Economic Analysis (B.E.A.) and the U.S. Census. I take a state's total GSP and divide it by said state's estimated population count to get the state's GSP per capita. I then calculate the Euclidean distance

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[3] I also utilized data reported by the National Council of State Legislatures to create the government partisan index for years 2011 – 2014. For Nebraska, I identified the partisan affiliation of the Speaker of the House, assigning partisan affiliation based on this information.

between states' GSP per capita, with the spatial weights matrix featuring the inverse of these distances.

I also operationalize economic similarity as the inverse distance between states' disposable personal income (DPI) per capita. To calculate this measure, I take a state's total DPI, the amount of money after paying taxes and divide it by said state's estimated population, yielding the state's DPI per capita. I then calculate the Euclidean distance between states' DPI per capita, with the spatial weights matrix featuring the inverse of these distances. To create this matrix, I utilize the DPI data provided by the B.E.A, as well as the same population estimates used previously.

Public Opinion

Because both policy liberalism measures focus on a broad, yet unique policy domain, I use Caughey and Warshaw's (2018) measures of mass preferences for economic and social policy respectively to represent public opinion. Using a dynamic, hierarchical group-level item-response model, Caughey and Warshaw aggregate numerous survey responses concerning economic and social policy preferences to infer the liberalism of the public's policy preferences. Economic policy-related survey questions covered topics such as taxes, social welfare, and labor regulations while social policy-related survey questions included issues like alcohol, abortion, and gay rights (Caughey and Warshaw 2018).

Temporal Dependence

To account for temporal dependence, I include lags of the dependent variables. I determined the number of lagged dependent variables via a general-to-specific modeling strategy (De Boef and Keele 2008). For both economic and social policy liberalism, I included one-year lags. The lagged dependent variables provide a test for the hypothesis that responsiveness is

incremental in the short-run but substantial in the long-run. Tables 1 and 2 presents summary statistics for both economic and social policy liberalism.

Insert Table 1 Here

Insert Table 2 Here

Results

Economic Policy Liberalism

Table 3 presents the results from the regression models estimated when the dependent variable is economic policy liberalism. The first column shows the results from a non-spatial model estimated via ordinary least squares (OLS). The second column displays the results from the "best" [4] spatial model.

Insert Table 3 Here

The first section of Table 3 accounts for the temporal component of the regression models. For both models, the lagged dependent variables are positive and statistically significant at the 0.01 level. Empirically, this result means that states' economic policy liberalism scores at time $t - 1$ is a strong predictor of said states' economic policy liberalism score at time t. In other words, if a state had a high (low) level of economic policy liberalism in the past, said state will have relatively high (low) economic policy liberalism in the future. This finding is important for both substantive and empirical reasons. Substantively, it is not surprising given policy is typically characterized with periods of stasis and stability (Baumgartner and Jones 1993). Empirically, it means that there is both a instantaneous (short-run) effect and an overall (long-

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[4] I estimate a m-STAR model representing every possible combination of geographic, political, residential, and economic spatial lags as defined previously, resulting in the estimation of eight total models. The results presented are from the models with the most negative Akaike information criterion (AIC) and Bayesian information criterion (BIC).

run) effect that need consideration. Overall, the statistically significant lagged dependent variable provides preliminary evidence in support of Hypothesis 3, that there should be greater responsiveness in the long-run.

The second section of Table 3 presents the results from the independent variable of interest. Prior research shows as mass economic policy liberalism increases, states' economic policy liberalism also increases (Caughey and Warshaw 2018). The coefficient estimate for lagged mass economic policy liberalism is positive and significant at the 0.05 level for the OLS model, and significant at the 0.1 level for the spatial models. Thus, without accounting for either spatial or temporal dynamics, an increase in the public's economic policy liberalism yields increased liberalism in their state's economic policy output.

The third and final section of interest in Table 3 presents the coefficient estimates for the spatial lags. The spatial model shown in Table 3 is an m-STAR model featuring four spatial lags. Here, the spatial lags represent inverse geographic distance, government political control similarity, inverse GSP per capita distance between states, and inverse citizen ideology distance between states. The coefficient estimates for the spatial lags are positive and statistically significant at the 0.01 level, with the exception of the coefficient estimate associated with the GSP per Capita spatial lag. Thus, states that are geographically, politically, and residentially similar will potentially have similar levels of economic policy liberalism.

Social Policy Liberalism

Table 4 presents the results from models estimated when the dependent variable is social policy liberalism. Similar to Table 3, Table 4 reports the results from both OLS and m-STAR models.

Insert Table 4 Here

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Just as with Table 3, Table 4 features three main sections that report the results of the econometric models. The first section states the results of the temporal component of the models. For both models, the lagged dependent variable is positive and statistically significant at the 0.01 level. Thus, states' social policy liberalism scores at time $t-1$ is a strong predictor of said states' social policy liberalism score at time t.

The second section of Table 4 presents the results from the independent variable of interest. Similar to economic policy liberalism, prior research shows as mass social policy liberalism increases, states' social policy liberalism also increases (Caughey and Warshaw 2018). The coefficient estimate for lagged mass social policy liberalism is positive and significant at the 0.01 level for both the OLS and spatial models. Thus, without accounting for either spatial or temporal dynamics, an increase in the public's social policy liberalism yields increased liberalism in their state's social policy output.

The third and final section of interest in Table 4 presents the coefficient estimates for the spatial lag variables. Here, the spatial lags represent inverse geographic distance, government political control similarity, inverse GSP per capita distance between states, and inverse citizen ideology distance between states. The results for these spatial lags are a little more mixed. For example, the coefficient estimates associated with geographic distance and DPI per cpita distance between states are negative and statistically insignificant. The coefficient estimates on government political similarity and citizen ideology distance between states are positive. Regarding statistical significance, the coefficient estimate associated with government political similarity is significant at the 0.01 level while the coefficient estimate associated with citizen ideology distance is insignificant. Thus, states whose governments have similar partisan control will potentially have similar levels of social policy liberalism.

According to the results presented in Tables 3 and 4, there is initial evidence in support of two of the three hypotheses previously stated. Recall, Hypothesis 1 stated that intrastate responsiveness is different in the presence of policy interdependence. The results in Tables 3 and 4 show that the coefficient estimates for the lagged mass policy liberalism variables are either similar or smaller in the m-STAR models compared to the OLS models Hypothesis 3 indicated that responsiveness is weaker in the short-run but stronger in the long-run. Both Tables 3 and 4 feature statistically significant coefficeint estimates for the lagged dependent variables.

Interpretation and Discussion

Because the models feature both spatial and temporal parameters, interpretation of interested coefficients is not straightforward. In other words, one cannot rely on the resported coefficient estimates as definitive evidence in support of or against the hypotheses. Furthermore, relying strictly on the coefficient estimates does not help with determining whether there is evidence in support of a significant relationship between public opinion and policy between states.

The second section presents maps of the short- and long-run counterfactuals of states response ot a public opinion shaock in a specific state. The third and final section presents plots of the impulse response functions for a specific state's direct and indirect effects for a specific year.

Average Direct, Indirect, and Total Effects

To ease interpretation, I present figures visualizing the relationship between public opinion and policy output in the presence of spatial interdependence. The first section presents time series plots of the short- and long-run average direct, indirect, and total effects and their

calculted 95% confidence intervals. To calculate these effects, I utilize the following reduced-form formulas:

$$\frac{\partial y}{\partial x_{SR}} = [I_N - W]^{-1}(\beta)$$

$$\frac{\partial y}{\partial x_{LR}} = [I_N - W - \phi I_N]^{-1}(\beta)$$

For Equation 2a, $[I_N - W]^{-1}$ represents a $N \times N$ matrix of short-run spatial multipliers while

$[I_N - W - \phi I_N]^{-1}$ represents a $N \times N$ matrix of long-run spatial multipliers for Equation 2b.

Because of the difficulty in presenting matrices of partial derivatives, instead I report summary measures: average direct effect, average total effect, and average indirect effect (Elhorst 2014; LeSage and Pace 2009). I calculate the average direct effect by calculating the average of the main diagonal elements from the partial derivative matrices. This calculation represents, on average, how a unit will respond to a shock originating within said unit. Substantively, the average direct effect represents intrastate responsiveness: how a state's policy output responds to a shock to said state's public opinion. I calculate the average total effect by calculating the average of the row sums from the partial derivative matrices. This calculation represents, on average, how a unit will respond to a shock originating in all units. Substantively, the average total effect represents total responsiveness: how a state's policy output responds to a shock to public opinion in all states. Finally, I calculate the average indirect effect by calculating the difference between the average total and direct effects. This calculation represents, on average, how a unit will respond to a shock originating in another unit. Substantively, the average indirect effect represents interstate responsiveness: how a state's policy output responds to a shock to another state's public opinion.

Figures 1 and 2 presents time series plots of the immediate and overall average intrastate, total, and interstate responsiveness regarding economc policy liberalism. I created these plots due to the dynamic nature of the non-geographic spatial weights matrices. Thus, for each year, I calculated the effects while fixing the non-gegraphic spatial weights matrices to a given year (Hays, Kachi, and Franzese 2010).

Insert Figure 1 Here

Insert Figure 2 Here

According to Figure 1, it appears that states produce positive statistically significant responses immediately to changes in economic policy preferences. In other words, once mass economic policy preferences becomes more liberal, states respond via immediately increasing the policy liberalism of their economic policy output. The results from Figure 2, however, are not consistent with the results produced in Figure 1. According to Figure 2, states will respond in the long-run to within-state increased liberalism in mass economic policy preferences by increasing the liberalism of their economic policy output. Thus, states are responsive to their own constituents. However, the results from Figure 2 also suggest that states will respond to increased liberalism in other states' mass economic policy preferences by decreasing the liberalism of their economic policy output. In other words, states are not responsive to out-of-state preferences regarding economic policy. With respect to statistical significance, the long-run intrastate and interstate responsiveness was statistically significant for the entire period. The long-run total responsiveness was statistically significant for every year except 2014.

Figures 3 and 4 presents time series plots of the immediate and overall average intrastate, total, and interstate responsiveness regarding social policy liberalism.

Insert Figure 3 Here

Insert Figure 4 Here

According to Figure 3, it appears that states also produce positive statistically significant responses immediately to changes in social policy preferences. In other words, once mass social policy preferences becomes more liberal, states respond via immediately increasing the policy liberalism of their social policy output. The results from Figure 4 yield similar conclusions. States will respond in the long-run to changes in mass social policy preferences by increasing the liberalism of their social policy output. However, these results are statistically insignificant for a handful of years in the mid-1970s, and statistically significant for all other years. Thus, states are responsive to both in- and out-of-state mass social policy preferences.

Overall, these results provide substantial evidence in support of the three hypotheses. The average direct effect plots demonstrate that changes in state policy output correspond with a change in mass policy preferences in the same direction: as mass prefernces in a state become more liberal, said state's policy output also becomes more liberal. The average indirect effect plots, however, provide conflicting results. For social policy, as mass preferences in a state becomes more liberal, another state's policy output will also become more liberal. For economic policy, however, as mass preferences in a state becomes more liberal, another state's policy output will become more conservative. Finally, comparing the short- and long-run policy changes, I demonstrate that there is in fact greater policy change in the long-run compared to the policy changes occuring in the short-run.

Counterfactuals

Although the average direct, indirect, and total effects are good for hypothesis testing, there are drawbacks to utilizing these summary measures for the purposes of interpretation. For example, reporting summary measures does away with the hetereogeneity that results when

examinign specific state effects. Furthermore, the summary effects rely on the presumption that the increase in mass preferences a state experience is the equivalent of a one-unit increase. Given that the data for mass economic and social plicy preferences ranges from -0.93 to 0.65 and -1.25 to 2.7 respectively, it is difficult to imagine ever observing a state experiencing such a sizeable shift in public opinion.

In order to examine the effect a specific increase in public opinion has on individual states' policy outputs, I calculated counterfactuals. I calculated the counterfactuals based on the following procedure. First, I calculated the predicted values of policy liberalism, holding all variables at their observed values. Next, I calculated the predicted values of policy liberalism by increasing the observed mass policy preferences variable for a single state by one standard deviation, holding all other variables at their observed values. Finally, I calculated the difference between the two sets of predicted values. This calculated difference represents the change in policy liberalism due to a s hock to a single state's mass policy preferences.

Figures 5 and 6 presents maps of the change in policy liberalism for states in both the short- and the long-run respectively.

Insert Figure 5 Here

Insert Figure 6 Here

Figure 5 presents maps representing how states' economic policy liberalism responds to a one standard deviation increase in mass economic policy liberalism.[5] According to the short-run map, Figure 5a, the states experiencing the largest immediate response to a shock to Iowa's mass economic policy liberalism are Iowa, Illinois, Indiana, Kansas, Minnesota, Missouri, Mississippi, Nebraska, South Dakota, and Wisconsin. In other words, when the economic policy preferences

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[5] I calculated results for each state in each year, in addition to Iowa in 2014.

in Iowa become more liberal, these states' response is to immediately increase the liberalism of their economic policy. According to the long-run map, Figure 5b, nearly all the same states will experience smallest decrease in their economic policy liberalism in response to a shock to Iowa's mass economic policy liberalism. The only difference is that Colorado joins the list of other states as experiencing the largest increases, not Indiana. In other words, states like Colorado and Illinois will respond to Iowa's increased mass economic liberalism by decreasing the liberalism of their economic policy output. However, the decrease is not large compared to the reactions of the other states. The main takeaway is that the states experiencing the largest reactions to changes occuring in Iowa, regarding economic policy, are states that are either in close geographic proximity to Iowa, or are similar with respect to either government partisan control or citizen ideology.

Figure 6 presents maps representing how states' social policy liberalism responds to a one standard deviation increase in mass social policy liberalism. According to the short-run map, Figure 6a, the states experiencing the largest immediate response to a shock to Iowa's mass social policy liberalism are Iowa, Alaska, Arizona, Florida, Idaho, Maine, Mississippi, Oregon, Pennsylvania, and Utah. In other words, when the social policy preferences in Iowa become more liberal, these states' response is to immediately increase the liberalism of their social policy. The long-run map, Figure 6b, presents similar results. However, the difference is that states Maine and Oregon are now replaced with Georgia and Texas. The main takeaway is that the states experiencing the largest reactions to changes occuring in Iowa, regarding social policy, are states that are predominately similar to Iowa in terms of their government partisan composition.

Response Paths

Overall, the results presented in these counterfactual maps yield similar conclusions as the average direct, indirect, and total effect plots. States are responive to changes in their own constituents' public opinion, and react accordingly. States responding to changes in neighboring states' public opinion, however, depends on the policy area. For social policy, states are responsive to public opinion in neighboring states. For economic policy, however, states are not responsive to public opinion in neighboring states. The logical question one should ask, based on these results, is why would states be responsive in one policy area but not the other? The problem with such a question is that any answer stems from the assumption that states are truly not responsive to public opinion in neighboring states regarding economic policy. In other words, what if the negative long-run interstate responsiveness reported in both the time series effect plots and the counterfactual maps is not *truly* negative?

In order to answer this question, I calculated the over-time response paths for the long-run effect. Calculating the response paths is similar to calculating the partial derivative as described above with Equation 2. The difference is that instead of working with a single panel, I now utilize the entire time series cross-sectional dataset. To calculate these resposne paths, I utilize the following formulas:

$$\frac{\partial y}{\partial x_{LR}} = [I_{NT} - W - \phi M]^{-1}(\beta)$$

$$W \equiv \sum_{r=1}^{R} \rho_r (W_r \otimes I_T)$$

For Equation 3a, $[I_{NT} - W - \phi V]^{-1}$ represents a $NT \times NT$ matrix of the non-cumulative marginal spatio-temporal effects over time, with M representing the first-order temporal lag matrix. Equation 3b represents the linear combination of the Kronecker product of a spatial

weights matrix and an identity matrix of size T (number of time periods), and its corresponding

spatial autoregressive parameter (Franzese and Hays 2008; Hays, Kachi, and Franzese 2010).[6]

The purpose of these response paths is to trace how a permanent one-unit shock to a unit evolves

over time.

Figures 7 and 8 present the response paths for both economic and social polciy

liberalism.

Insert Figure 7 Here

Insert Figure 8 Here

For both figures, I again utilize Iowa in 2014 as the test case. Here, I calculate the

response paths of Iowa's response to a shock to its own mass policy liberalism, and the response

of another state, Illinois, to a shock to Iowa's mass policy liberalism. According to Figure 7a,

Iowa responds to a shock to its own mass economic policy liberalism by increasing its economic

policy liberalism by more than 0.03 units at time $t = 0$. As t increases, the non-cumulative effect

decreases, reaching its minimum around $t = 20$. Thus, for the first 20 periods, it appears that the

non-cumulative effect is approaching equilibrium. It is at this point the non-cumulative effect

begins to increase again, reaching over 0.025 at $t = 50$. In other words, the non-cumulative

effect is drifting away from equilibirum. When adding the individual non-cumulative effects

together, the sum is more than 2.5 times the size of the long-run direct effect calculated based on

Equation 2.

According to Figure 7b, Illinois responds to a shock to Iowa's mass economic policy

liberalism with a steady increase in its non-cumulative effect. At no time does this non-

cumulative effect ever approach equilibrium. When adding the individual non-cumulative effects

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[6] Because of the dynamic nature of the non-geographic spatial weights matrices, I take a single year spatial weights matrix for the non-geographic spatial lags, and calculate the Kronecker product with the T sized identity matrix.

together, the sum is more than 87 times the size of the long-run direct effect calculated based on Equation 2. Thus, these results show that in the case of economic policy liberalism, it is not the case that states have a negative response to out-of-state public opinion in the long-run. Instead, the effects are very large. So large they give the impression the effect operates in the opposite direction, when in fact, it does not. This is not surprising, given that many economic policy decisions depend on the actions of neighboring states (Caughey and Warshaw 2018).

The results presented in Figure 8 support the results presented in the previous two sections. In both figures, the non-cumulative response path is always approaching equilibrium as t increases. Furthermore, the cumulative effects calculated from the response paths approximate the calcualted effects from the partial derivative based on Equation 2. In other words, regarding social policy, both Iowa and Illinois positively respond to a shock to Iowa's mass social policy liberalism.

Conclusion

In this paper, I build on policy responsiveness theory by incorporating interdependent relationships underlying policymaking. I argue that there is an indirect way for lawmakers to respond to public opinion outside of their jurisdiction. Specifically, I argue that the means of this indirect approach is policy interdependence, where policy decisions is a product of policy decisions made elsewhere.Accounting for policy interdependence in policy responsiveness models leads to two types of responsiveness. A state's total responsiveness is the combination of intrastate responsiveness (how responsive government is to its constituents), and interstate responsiveness (how responsive government is to constituencies in another jurisdiction). I operationalized policy interdependence via spatial lags constructed using multiple definitions of space between the states: geographic, political, residential, and economic space. Using an m-

STAR spatial econometric model, I estimate the influence mass policy preferences has on policy liberalism in the presence of policy interdependence.

According to the empirical results, increases in mass policy liberalism lead to immediate increases in economic and social policy liberalism across states. Overall, while an increase in mass social policy liberalism leads to increases in social policy liberalism across all states, the results suggested that an increase in mass economic policy liberalism leads to decreases in social policy liberalism. However, further analysis revealed that in fact the effect changes in mass economic policy preferences has on economic policy liberalism, in the long-run, are in fact positive.

These empirical results yield essential normative implications. If the goal of a democratic society is for policymakers to make policy decisions that reflect the preferences of its citizens, the empirical results suggest elected officials are meeting this goal in some respects. In the immediate, politicians are slightly more responsive to changes in constituent preferences in the presence of interdependence concerning social policy. However, concerning economic policy, lawmakers are somewhat less responsive in the immediate to constituent preferences in their state. This dynamic is also true in the long-run, even accounting for interdependence. In the case of spillover responsiveness, policymakers are slightly responsive in the positive direction to immediate out-of-state public opinion shocks for both economic and social policy. In the long-run, however, states will increase their social policy liberalism in response to out-of-state public opinion shocks. For economic policy, states will reduce their economic policy liberalism in response to out-of-state public opinion shocks. Thus, when considering interdependence, public opinion influences policy decisions and actions in a manner that is different from existing policy responsiveness studies.

There are numerous directions future research can go concerning this topic. The literature already identifies two mechanisms responsible for policymakers responding to constituents in their state: selection and adaptation. Selection refers to the dynamic where the public's liberalism leads them to elect candidates who in turn will implement policy close to the constituency preferences. Adaptation involves lawmakers directly responding to shifts in constituent preferences (Caughey and Warshaw 2018). However, there is not as extensive of literature focusing on identifying the mechanisms of spillover responsiveness. In defining surrogate representation, Mansbridge (2003) highlights that absent the involvement of money via campaign contributions, or absent a sense of responsibility to marginalized constituencies in other states there is no power dynamic between an elected officeholder in one state and individuals in another state. Thus, future research needs to investigate the mechanisms responsible for policymakers responding to out-of-state constituencies. Specifically, does the selection and adaptation mechanisms operate in an interdependent context.

The conclusions drawn from the empirical results rely on the assumption that shocks to public opinion in one state do not lead to public opinion shocks in neighboring states. Thus, another future direction involves a refinement of the m-STAR model, which includes spatial interdependence among independent variables. By considering changes in public opinion, one can identify with additional clarity whether interdependence indeed strengthens or weakens the opinion-policy relationship.

Finally, future scholars should also examine the role of interdependence from a policy feedback perspective. There is extensive literature that demonstrates policy outcomes have a significant effect on public opinion, both nationally (Soroka and Wlezien 2010; Wlezien and Soroka 2007) and at the state level (Pacheco and Maltby 2017; Pacheco 2012). Thus, future

research should investigate whether shifts in policy output influences public opinion in neighboring states and the mechanism(s) responsible for this relationship.

Policymaking does not occur in a vacuum. Not only do factors within a state influence the policy outputs and preferences of a state, but the results presented in this paper suggest that the actions of one state influence the policy outputs of another state. This phenomenon is a significant contribution to both the policy responsiveness and interdependence literature, as this paper identifies new external influences to policy responsiveness via interdependence.

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Table 1: Economic Policy Liberalism -- Summary Statistics

	Overall				Between			Within		
	Mean	SD	Min	Max	SD	Min	Max	SD	Min	Max
Economic Policy Liberalism	0.017	1.00	-2.24	3.13	0.95	-1.75	2.15	0.35	-1.77	1.54
Economic Policy Liberalism Lag	0.018	1.00	-2.24	3.13	0.94	-1.75	2.13	0.35	-1.85	1.55
Mass Economic Policy Liberalism	-0.053	0.25	-0.93	0.65	0.16	-0.43	0.30	0.19	-0.73	0.55
Geographic Distance Spatial Lag	-0.080	0.59	-1.68	1.69	0.57	-1.35	1.12	0.18	-0.83	0.66
Government Partisan Composition Spatial Lag	0.007	0.16	-0.58	0.54	0.05	-0.08	0.10	0.15	-0.57	0.48
Citizen Ideology Spatial Lag	0.000	0.02	-0.05	0.87	0.00	-0.00	0.02	0.02	-0.05	0.85
Gross State Product per Capita Spatial Lag	0.001	0.04	-0.06	1.96	0.01	-0.00	0.04	0.04	-0.06	1.92
N (Number of Total Observations)	2550									
n (Number of Cross-Sectional Units)	50									
T (Number of Time Points)	51									

Table 2: Social Policy Liberalism -- Summary Statistics

	Overall				Between			Within		
	Mean	SD	Min	Max	SD	Min	Max	SD	Min	Max
Social Policy Liberalism	0.018	0.92	-2.51	2.73	0.85	-1.68	1.91	0.37	-1.87	1.47
Social Policy Liberalism Lag	0.017	0.91	-2.49	2.73	0.84	-1.65	1.89	0.38	-1.89	1.44
Mass Social Policy Liberalism	0.155	0.56	-1.25	2.70	0.34	-0.36	0.81	0.45	-1.05	2.08
Geographic Distance Spatial Lag	0.038	0.31	-0.49	1.46	0.31	-0.30	1.08	0.07	-0.32	0.47
Government Partisan Composition Spatial Lag	0.004	0.15	-0.58	0.63	0.05	-0.07	0.09	0.15	-0.57	0.57
Citizen Ideology Spatial Lag	0.001	0.03	-0.04	1.41	0.00	-0.00	0.03	0.03	-0.04	1.38
Disposable Personal Income per Capita Spatial Lag	-0.001	0.02	-0.82	0.19	0.00	-0.02	0.00	0.02	-0.81	0.19
N (Number of Total Observations)	2550									
n (Number of Cross-Sectional Units)	50									
T (Number of Time Points)	51									

Table 3: Economic Policy Liberalism -- OLS and Spatial Regression Results

	OLS	m-STAR
Economic Policy Liberalism_t-1	0.87***	0.85***
	(0.01)	(0.01)
Mass Economic Policy Liberalism_t-1	0.05**	0.03*
	(0.02)	(0.02)
Geographic Distance Spatial Lag		0.13***
		(0.03)
Government Partisan Composition Spatial Lag		0.11***
		(0.02)
Gross State Product per Capita Spatial Lag		0.03
		(0.08)
Citizen Ideology Spatial Lag		0.53***
		(0.09)
Observations	2550	2550
AIC	-2128.55	-2221.37
BIC	-2116.86	-2180.46

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Standard errors reported in parentheses.

Models estimated with unit fixed effects (results not included)

Table 4: Social Policy Liberalism -- OLS and Spatial Regression Results

	OLS	m-STAR
Social Policy Liberalism_t-1	0.90***	0.89***
	(0.01)	(0.01)
Mass Social Policy Liberalism_t-1	0.08***	0.08***
	(0.02)	(0.02)
Geographic Distance Spatial Lag		-0.02
		(0.05)
Government Partisan Composition Spatial Lag		0.12***
		(0.02)
Disposable Personal Income per Capita Spatial Lag		-0.02
		(0.04)
Citizen Ideology Spatial Lag		0.17
		(0.12)
Observations	2550	2550
AIC	-2473.42	-2495.80
BIC	-2455.89	-2449.05

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Standard errors reported in parentheses.

Models estimated with unit fixed effects (results not included)

Figure 1: Economic Policy Liberalism – Short-Run Average Effects
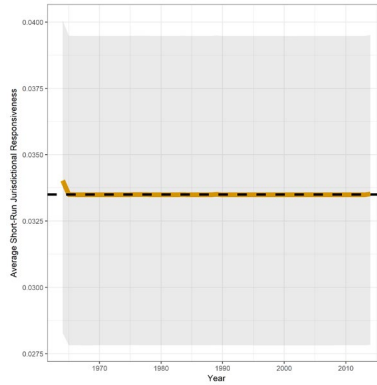
Figure 1a: Intrastate Responsiveness
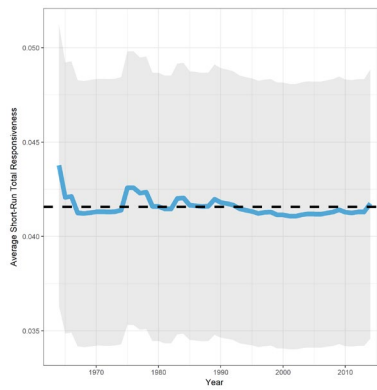
Figure 1b: Total Responsiveness
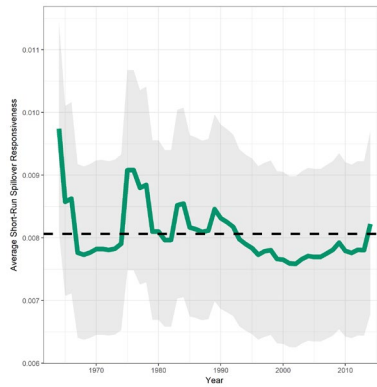
Figure 1c: Interstate Responsiveness

Figure 2: Economic Policy Liberalism – Long-Run Average Effects
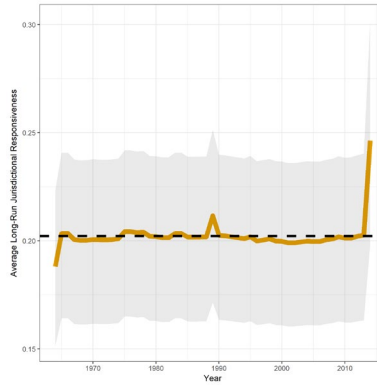
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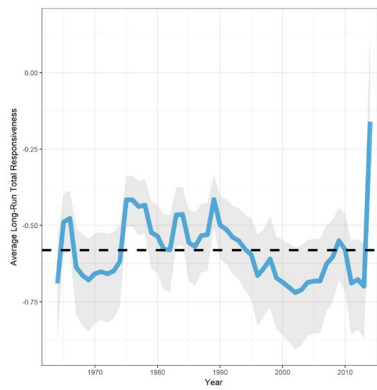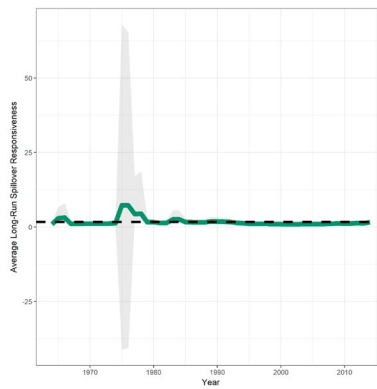

Figure 1b: Total Responsiveness
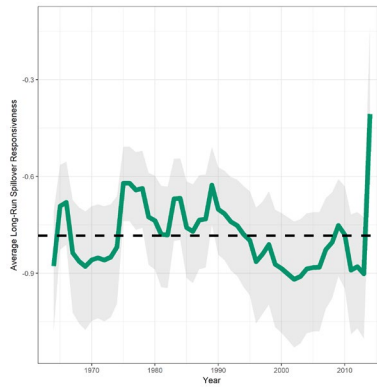
Figure 1c: Interstate Responsiveness

Figure 3: Social Policy Liberalism – Short-Run Average Effects
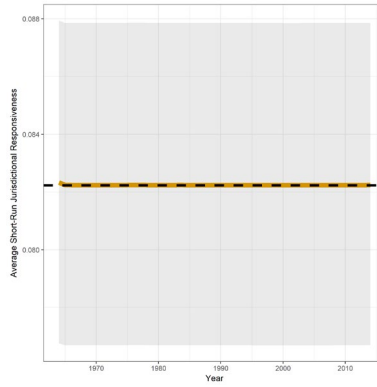
Figure 1a: Intrastate Responsiveness
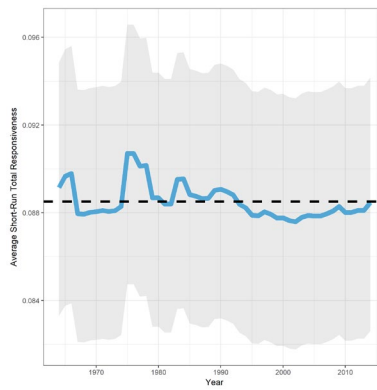
Figure 1b: Total Responsiveness
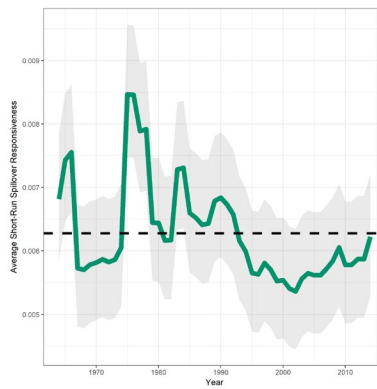
Figure 1c: Interstate Responsiveness

Figure 4: Social Policy Liberalism – Long-Run Average Effects
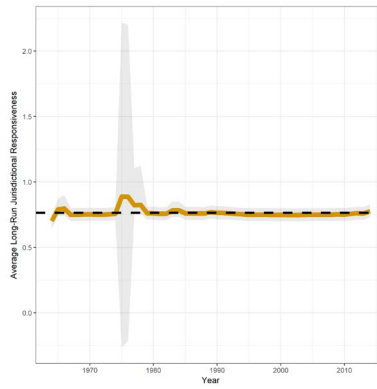
Figure 1a: Intrastate Responsiveness
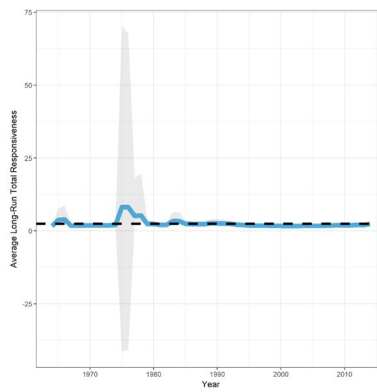
Figure 1b: Total Responsiveness

Figure 1c: Interstate Responsiveness

Figure 5: Economic Policy Liberalism – Counterfactuals (2014)
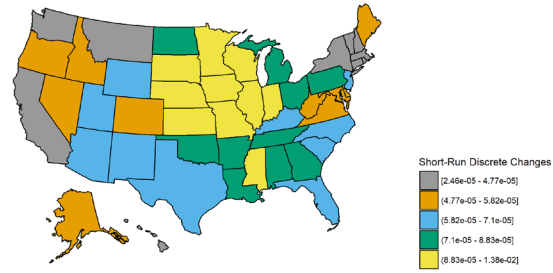
Figure 5a: Short-Run
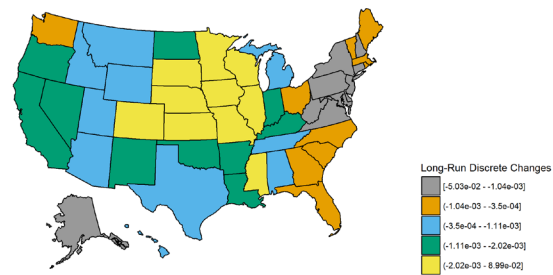
Figure 5b: Long-Run

Figure 6: Social Policy Liberalism – Counterfactuals (2014)
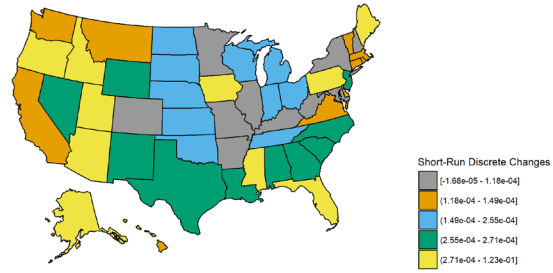
Figure 6a: Short-Run
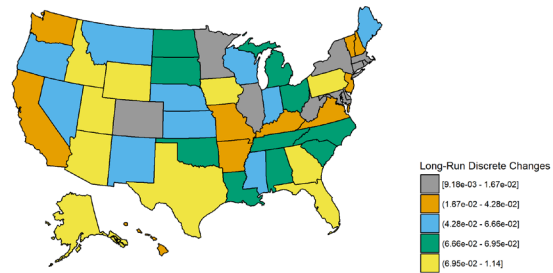
Figure 6b: Long-Run

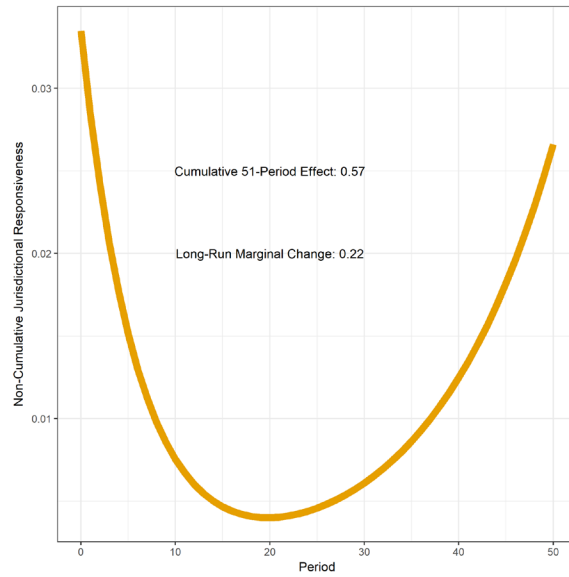Figure 7: Economic Policy Liberalism – Impulse Response Functions (2014)

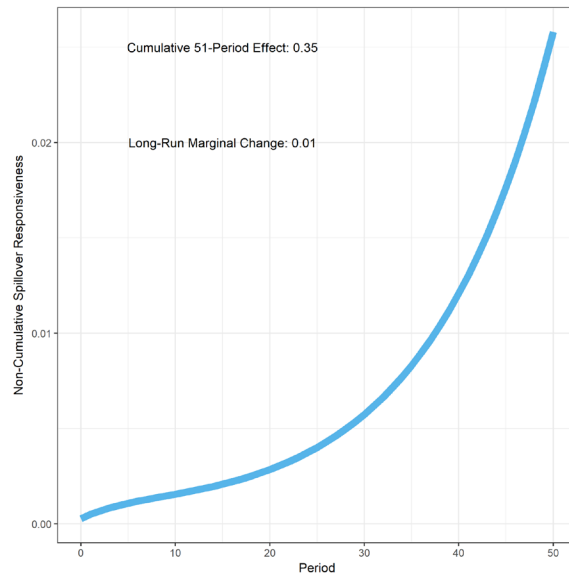
Figure 7a: Shock State: Iowa; Response State: Iowa

Figure 7a: Shock State: Iowa; Response State: Illinois

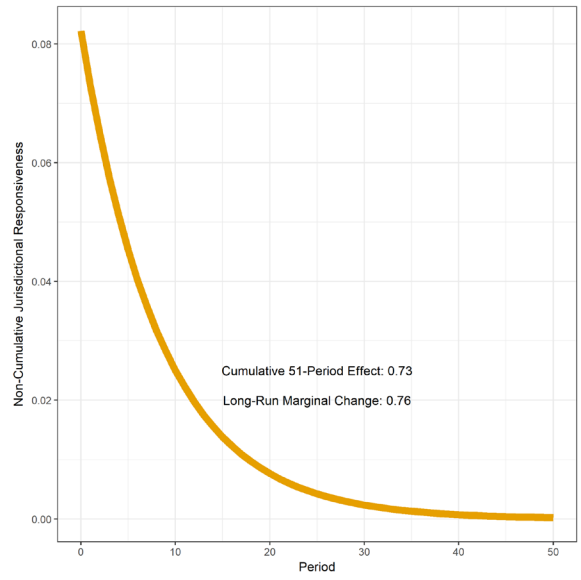Figure 8: Social Policy Liberalism – Impulse Response Functions (2014)

Cumulative 51-Period Effect: 0.73

Long-Run Marginal Change: 0.76

Figure 8a: Shock State: Iowa; Response State: Iowa

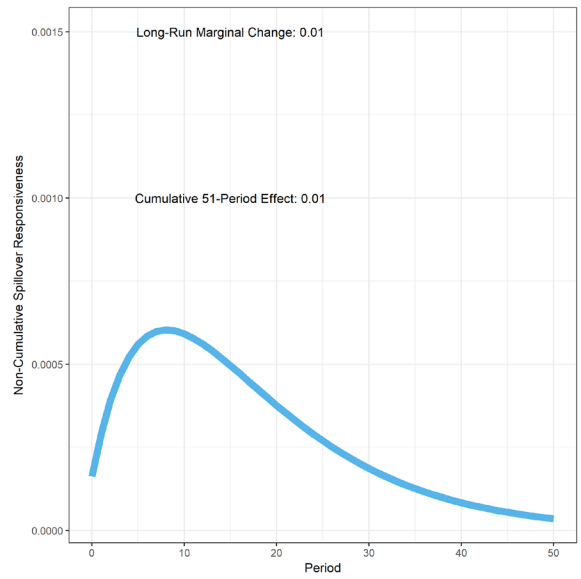Long-Run Marginal Change: 0.01

Cumulative 51-Period Effect: 0.01

Figure 8a: Shock State: Iowa; Response State: Illinois