The Impact of Adding Puerto Rico and D.C. on the Distribution of House Voting Power

Introduction

This project seeks to understand how the admission of Puerto Rico and the District of Columbia would impact voting power distribution in the US House of Representatives. From that understanding, this paper seeks to analyze which demographics are most impacted by the projected shift in voting power. Using game theory, this project analyzes the power of Representatives to form winning coalitions from non-winning coalitions.

The two lenses that this project uses are the lens of states as unified actors and the lens of Representatives as individual actors. These lenses may partially explain why certain representatives respond to DC and PR Statehood bills in different ways.

Literature Review

Shapley Shubik Power Index (SSPI) is a metric that measures voting power in a given system of voters (Shapley et al. 1954). It is calculated through the following method:

> Consider all sequences of voters in a system. The Shapley-Shubik Index for a given voter is the frequency in which that voter is pivotal (meaning their vote will "swing" the coalition of voters from non-winning to winning) for the coalition of all voters preceding that voter in all sequences (Shapley et al. 1954).

SSPIs have been in use for political analysis since their conception (See e.g. Schubert 1958). For our purposes, the SSPI will be used to identify the power of states and representatives. The number can be loosely associated with that state's/representative's "piece of the pie." In this case, that pie is the voting power in congress.

The District of Columbia was created with the ratification of the US Constitution through Article 1 Section 8 Clause 17.[1] Framers of the Constitution like James Madison believed that

[1] U.S. Const. art. I, § 8.

there was a need for Congress to control the Capital city of the US (Federalist 43, Madison 1788). In *Federalist* No. 43, James Madison described the role of the Capital. He explained that it would still be represented nationally (Madison 1788). Disputes surrounding suffrage for residents of the capital began almost immediately. They took many forms, but eventually shifted into the modern push for statehood in 1888 with the introduction of the first proposal to consider statehood.

Statehood for the District of Columbia has been a hot topic in recent years. In 2015, DC Mayor Muriel Bowser added a proposition for the residents of DC to vote on whether they want DC to be a state. It passed with over 90% approval. DC statehood thus became a bill again with the D.C. Admission Act (H.R. 51) in 2017.[2] The bill has passed in the House and is currently in the Senate.

Puerto Rico became a US territory after the Spanish American War in 1898. The Treaty of Paris defined the area as an unincorporated territory of the United States. Since then, the question of whether Puerto Rico should become a US state has come up multiple times to different responses. Most recently, Puerto Rican Statehood has become the popular opinion of the region. In 2020, Puerto Rico held a referendum on the statehood question that ended in a slim majority in support. It was then introduced into Congress through H.R. 1522 by Representative Darren Soto (D-FL-9) in March of 2021.[3] The bill is currently sitting in committee.

[2] https://www.congress.gov/bill/117th-congress/house-bill/51
[3] https://www.congress.gov/bill/117th-congress/house-bill/1522

Methodology

This project uses The Power Slave Mark II to calculate SSPIs of states in various simulations.[4] The goal is to identify the change in Shapley-Shubik value of each state's voting power after stimuli are introduced through the lenses of states acting in unity and through representatives acting alone. For our purposes, the stimuli will consist of:

1) Introducing the District of Columbia as a state
2) Introducing Puerto Rico as a state
3) Introducing both the District of Columbia and Puerto Rico as states

To identify the change, we first assign SSPI values to each state under the current appropriation of Representatives. For the most basic map, we will use the 218 simple majority as the baseline. We will also explore the 290 supermajority.

Next, we recalculate the SSPI values after adding the stimuli. When new states are admitted to the union, they are assigned a number of representatives based on population. Normally, the Hill apportionment method is used to assign representatives. However, this only occurs after the US census. Thus, Puerto Rico and DC would have additional representatives past the normal 435 until 2030. For the purposes of this paper, we are analyzing their immediate effect after admission.

For DC, we add 1 voter with 1 vote. We also switch to the new majority of 219. For PR, we add 1 voter with 4 votes. The new PR majority is 220. DCPR adds both voters and their respective votes under a new majority of 221.

[4] http://powerslave-02.utu.fi/index.html

We then take these new values and subtract the control values from them to find the net change. These are the change in SSPI values we use to analyze the effects of the stimuli (See Tables 1.1, 1.2, 1.3)

For further analysis, we order states based on different classifications and criteria (e.g. average household income). Then we create a scatter plot with the classification as the x-axis and the SSPI value change as the y-axis. Finally, we note any relationship with a trendline.

This analysis comes through the lens of states acting as unified voters. Thus, conclusions from this study must be taken with the fact that this is rarely true in mind.[5] The second half of the study analyzes the change in SSPI values from an individual representative's standpoint. To do so, we simply divide the change in SSPI value by the number of representatives in the State.

Results

Model 1 - States as Unified Actors

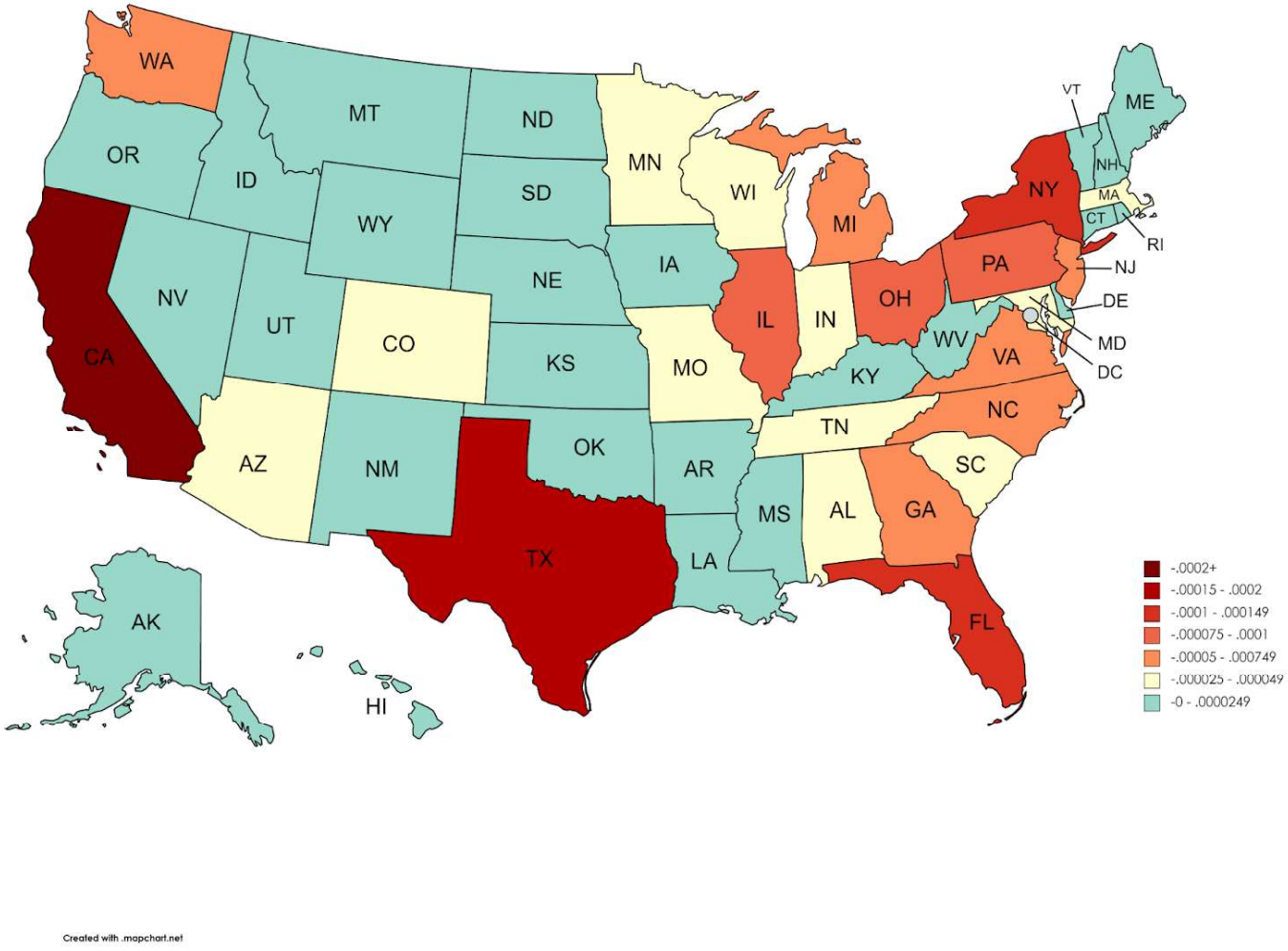
The SSPI value changes in this model are shown in Tables 1.1, 1.2, and 1.3. Additionally, maps of the United States with these value changes are shown in Diagrams 1.1, 1.2, and 1.3. States are listed using their abbreviated form in descending order based on number of representatives.

[5] Most states have representatives from both the Democratic Party and the GOP. Thus, they rarely act unified in their voting behavior on the basis of state representation.

State by rep #	rep # desc	S-S (218 control)	S-S (219 DC)	S-S Change
CA	53	0.13341	0.13309	-0.00032
TX	36	0.08603	0.08584	-0.00019
FL	27	0.06302	0.06288	-0.00014
NY	27	0.06302	0.06288	-0.00014
PA	18	0.0411	0.04101	-0.00009
IL	18	0.0411	0.04101	-0.00009
OH	16	0.03637	0.03629	-0.00008
GA	14	0.03167	0.03161	-0.00006
MI	14	0.03167	0.03161	-0.00006
NC	13	0.02934	0.02928	-0.00006
NJ	12	0.02703	0.02697	-0.00006
VA	11	0.02472	0.02467	-0.00005
WA	10	0.02242	0.02237	-0.00005
AZ	9	0.02013	0.02009	-0.00004
MA	9	0.02013	0.02009	-0.00004
TN	9	0.02013	0.02009	-0.00004
IN	9	0.02013	0.02009	-0.00004
MD	8	0.01786	0.01782	-0.00004
MO	8	0.01786	0.01782	-0.00004
WI	8	0.01786	0.01782	-0.00004
MN	8	0.01786	0.01782	-0.00004
CO	7	0.01559	0.01556	-0.00003
SC	7	0.01559	0.01556	-0.00003
AL	7	0.01559	0.01556	-0.00003
LA	6	0.01333	0.01331	-0.00002
KY	6	0.01333	0.01331	-0.00002
OR	5	0.01109	0.01107	-0.00002
OK	5	0.01109	0.01107	-0.00002
CT	5	0.01109	0.01107	-0.00002

UT	4	0.00885	0.00883	-0.00002
IA	4	0.00885	0.00883	-0.00002
NV	4	0.00885	0.00883	-0.00002
AR	4	0.00885	0.00883	-0.00002
MS	4	0.00885	0.00883	-0.00002
KS	4	0.00885	0.00883	-0.00002
NM	3	0.00662	0.00661	-0.00001
NE	3	0.00662	0.00661	-0.00001
WV	3	0.00662	0.00661	-0.00001
ID	2	0.00441	0.0044	-0.00001
HI	2	0.00441	0.0044	-0.00001
NH	2	0.00441	0.0044	-0.00001
ME	2	0.00441	0.0044	-0.00001
RI	2	0.00441	0.0044	-0.00001
MT	1	0.0022	0.00219	-0.00001
DE	1	0.0022	0.00219	-0.00001
SD	1	0.0022	0.00219	-0.00001
ND	1	0.0022	0.00219	-0.00001
AK	1	0.0022	0.00219	-0.00001
VT	1	0.0022	0.00219	-0.00001
WY	1	0.0022	0.00219	-0.00001
DC	1	N/A	0.00219	

Table 1.1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-.00005 - .000749
-.000025 - .000049
-0 - .0000249
Created with .mapchart.net

Figure 1.1

State by rep #	rep # desc	S-S (218 control)	S-S (220 PR)	S-S Change
CA	53	0.13341	0.13212	-0.00129
TX	36	0.08603	0.08525	-0.00078
FL	27	0.06302	0.06246	-0.00056
NY	27	0.06302	0.06246	-0.00056
PA	18	0.0411	0.04075	-0.00035
IL	18	0.0411	0.04075	-0.00035
OH	16	0.03637	0.03605	-0.00032
GA	14	0.03167	0.0314	-0.00027
MI	14	0.03167	0.0314	-0.00027
NC	13	0.02934	0.02909	-0.00025
NJ	12	0.02703	0.02679	-0.00024
VA	11	0.02472	0.02451	-0.00021
WA	10	0.02242	0.02223	-0.00019
AZ	9	0.02013	0.01996	-0.00017
MA	9	0.02013	0.01996	-0.00017
TN	9	0.02013	0.01996	-0.00017
IN	9	0.02013	0.01996	-0.00017
MD	8	0.01786	0.01771	-0.00015
MO	8	0.01786	0.01771	-0.00015
WI	8	0.01786	0.01771	-0.00015
MN	8	0.01786	0.01771	-0.00015
CO	7	0.01559	0.01546	-0.00013
SC	7	0.01559	0.01546	-0.00013
AL	7	0.01559	0.01546	-0.00013
LA	6	0.01333	0.01322	-0.00011
KY	6	0.01333	0.01322	-0.00011
OR	5	0.01109	0.01099	-0.0001
OK	5	0.01109	0.01099	-0.0001
CT	5	0.01109	0.01099	-0.0001

UT	4	0.00885	0.00878	-0.00007
IA	4	0.00885	0.00878	-0.00007
NV	4	0.00885	0.00878	-0.00007
AR	4	0.00885	0.00878	-0.00007
MS	4	0.00885	0.00878	-0.00007
KS	4	0.00885	0.00878	-0.00007
NM	3	0.00662	0.00657	-0.00005
NE	3	0.00662	0.00657	-0.00005
WV	3	0.00662	0.00657	-0.00005
ID	2	0.00441	0.00437	-0.00004
HI	2	0.00441	0.00437	-0.00004
NH	2	0.00441	0.00437	-0.00004
ME	2	0.00441	0.00437	-0.00004
RI	2	0.00441	0.00437	-0.00004
MT	1	0.0022	0.00218	-0.00002
DE	1	0.0022	0.00218	-0.00002
SD	1	0.0022	0.00218	-0.00002
ND	1	0.0022	0.00218	-0.00002
AK	1	0.0022	0.00218	-0.00002
VT	1	0.0022	0.00218	-0.00002
WY	1	0.0022	0.00218	-0.00002
PR	4	N/A	0.00878	N/A

Table 1.2

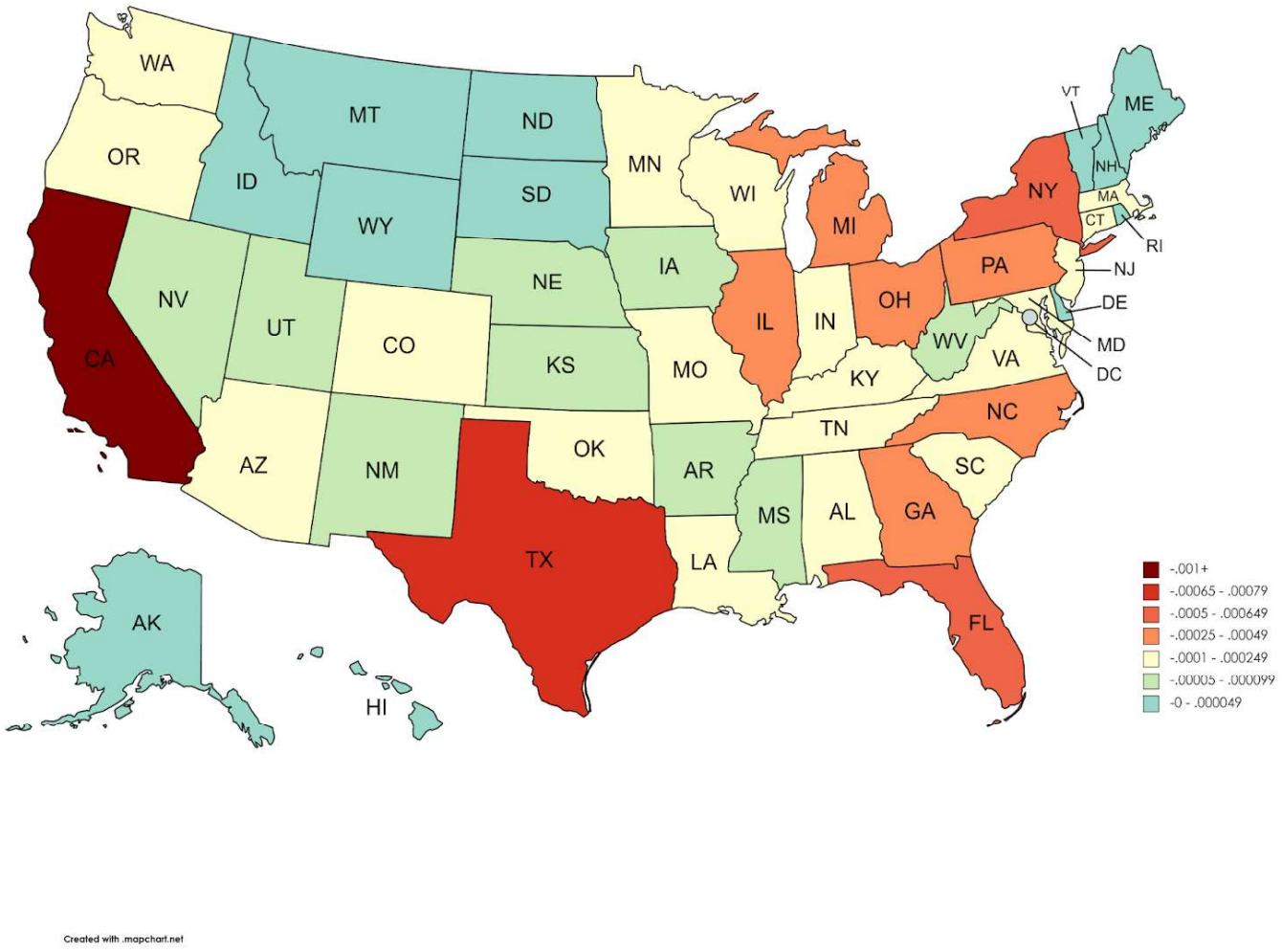

Figure 1.2

State by rep #	rep # desc	S-S (218 control)	S-S (221 DC+PR)	S-S Change
CA	53	0.13341	0.1318	-0.00161
TX	36	0.08603	0.08506	-0.00097
FL	27	0.06302	0.06232	-0.0007
NY	27	0.06302	0.06232	-0.0007
PA	18	0.0411	0.04066	-0.00044
IL	18	0.0411	0.04066	-0.00044
OH	16	0.03637	0.03597	-0.0004

GA	14	0.03167	0.03133	-0.00034
MI	14	0.03167	0.03133	-0.00034
NC	13	0.02934	0.02903	-0.00031
NJ	12	0.02703	0.02674	-0.00029
VA	11	0.02472	0.02445	-0.00027
WA	10	0.02242	0.02218	-0.00024
AZ	9	0.02013	0.01992	-0.00021
MA	9	0.02013	0.01992	-0.00021
TN	9	0.02013	0.01992	-0.00021
IN	9	0.02013	0.01992	-0.00021
MD	8	0.01786	0.01767	-0.00019
MO	8	0.01786	0.01767	-0.00019
WI	8	0.01786	0.01767	-0.00019
MN	8	0.01786	0.01767	-0.00019
CO	7	0.01559	0.01543	-0.00016
SC	7	0.01559	0.01543	-0.00016
AL	7	0.01559	0.01543	-0.00016
LA	6	0.01333	0.01319	-0.00014
KY	6	0.01333	0.01319	-0.00014
OR	5	0.01109	0.01097	-0.00012
OK	5	0.01109	0.01097	-0.00012
CT	5	0.01109	0.01097	-0.00012
UT	4	0.00885	0.00876	-0.00009
IA	4	0.00885	0.00876	-0.00009
NV	4	0.00885	0.00876	-0.00009
AR	4	0.00885	0.00876	-0.00009
MS	4	0.00885	0.00876	-0.00009
KS	4	0.00885	0.00876	-0.00009
NM	3	0.00662	0.00656	-0.00006
NE	3	0.00662	0.00656	-0.00006

WV	3	0.00662	0.00656	-0.00006
ID	2	0.00441	0.00436	-0.00005
HI	2	0.00441	0.00436	-0.00005
NH	2	0.00441	0.00436	-0.00005
ME	2	0.00441	0.00436	-0.00005
RI	2	0.00441	0.00436	-0.00005
MT	1	0.0022	0.00218	-0.00002
DE	1	0.0022	0.00218	-0.00002
SD	1	0.0022	0.00218	-0.00002
ND	1	0.0022	0.00218	-0.00002
AK	1	0.0022	0.00218	-0.00002
VT	1	0.0022	0.00218	-0.00002
WY	1	0.0022	0.00218	-0.00002
DC	1	N/A	0.00218	N/A
PR	4	N/A	0.00876	N/A

Table 1.3

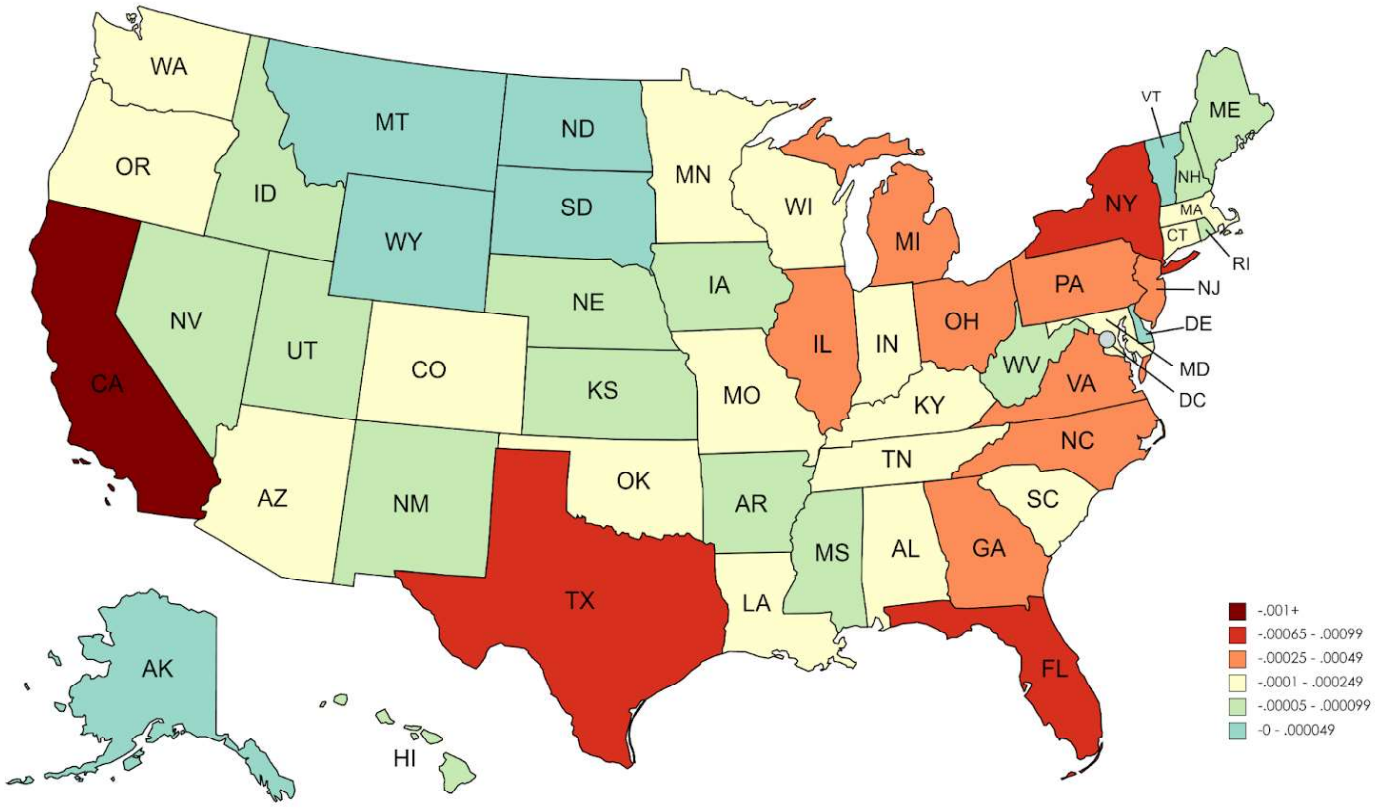

Figure 1.3

These models follow a fairly linear trend: The larger the State by population(interchangeable with the number of representatives), the larger their loss in SSPI value. This was my initial prediction, as a smaller state that starts with only a few votes would probably not lose too much of their power over the result of a vote with one more voter in the picture. However, for larger states, their winning coalitions become slightly harder to accomplish due to the increase in votes required for success.

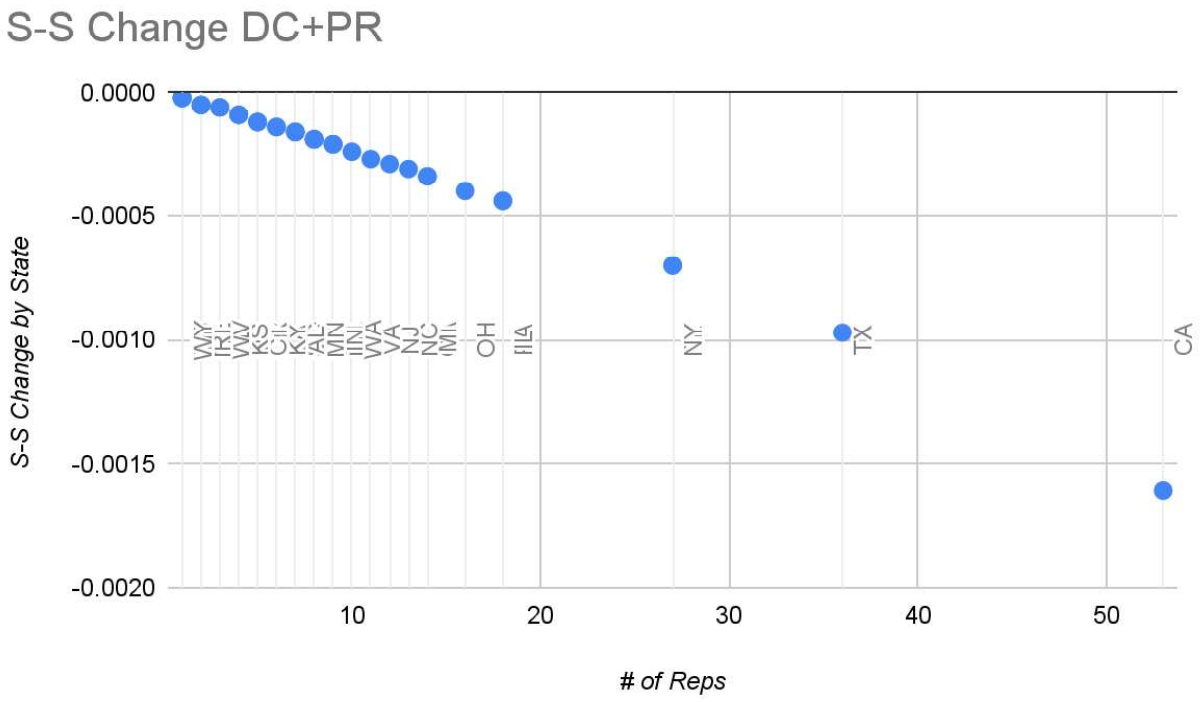

Figure 1.4

Model 2 - Representatives as individual actors

The SSPI value changes in this model are shown in Table 2.1, 2.2, and 2.3. Additionally, maps of the United States with these changes in values are shown in Figures 2.1, 2.2, and 2.3.

State by rep #	rep # desc	S-S (218control)	S-S (219 DC)	S-S Change	S-S Change/Rep
CA	53	0.13341	0.13309	-0.00032	-0.00000604
TX	36	0.08603	0.08584	-0.00019	-0.00000528
FL	27	0.06302	0.06288	-0.00014	-0.00000519
NY	27	0.06302	0.06288	-0.00014	-0.00000519
PA	18	0.0411	0.04101	-0.00009	-0.000005
IL	18	0.0411	0.04101	-0.00009	-0.000005
OH	16	0.03637	0.03629	-0.00008	-0.000005
GA	14	0.03167	0.03161	-0.00006	-0.00000429
MI	14	0.03167	0.03161	-0.00006	-0.00000429
NC	13	0.02934	0.02928	-0.00006	-0.00000462
NJ	12	0.02703	0.02697	-0.00006	-0.000005
VA	11	0.02472	0.02467	-0.00005	-0.00000455
WA	10	0.02242	0.02237	-0.00005	-0.000005
AZ	9	0.02013	0.02009	-0.00004	-0.00000444
MA	9	0.02013	0.02009	-0.00004	-0.00000444
TN	9	0.02013	0.02009	-0.00004	-0.00000444
IN	9	0.02013	0.02009	-0.00004	-0.00000444
MD	8	0.01786	0.01782	-0.00004	-0.000005
MO	8	0.01786	0.01782	-0.00004	-0.000005
WI	8	0.01786	0.01782	-0.00004	-0.000005
MN	8	0.01786	0.01782	-0.00004	-0.000005
CO	7	0.01559	0.01556	-0.00003	-0.00000429
SC	7	0.01559	0.01556	-0.00003	-0.00000429

AL	7	0.01559	0.01556	-0.00003	-0.00000429
LA	6	0.01333	0.01331	-0.00002	-0.00000333
KY	6	0.01333	0.01331	-0.00002	-0.00000333
OR	5	0.01109	0.01107	-0.00002	-0.000004
OK	5	0.01109	0.01107	-0.00002	-0.000004
CT	5	0.01109	0.01107	-0.00002	-0.000004
UT	4	0.00885	0.00883	-0.00002	-0.000005
IA	4	0.00885	0.00883	-0.00002	-0.000005
NV	4	0.00885	0.00883	-0.00002	-0.000005
AR	4	0.00885	0.00883	-0.00002	-0.000005
MS	4	0.00885	0.00883	-0.00002	-0.000005
KS	4	0.00885	0.00883	-0.00002	-0.000005
NM	3	0.00662	0.00661	-0.00001	-0.00000333
NE	3	0.00662	0.00661	-0.00001	-0.00000333
WV	3	0.00662	0.00661	-0.00001	-0.00000333
ID	2	0.00441	0.0044	-0.00001	-0.000005
HI	2	0.00441	0.0044	-0.00001	-0.000005
NH	2	0.00441	0.0044	-0.00001	-0.000005
ME	2	0.00441	0.0044	-0.00001	-0.000005
RI	2	0.00441	0.0044	-0.00001	-0.000005
MT	1	0.0022	0.00219	-0.00001	-0.00001
DE	1	0.0022	0.00219	-0.00001	-0.00001
SD	1	0.0022	0.00219	-0.00001	-0.00001
ND	1	0.0022	0.00219	-0.00001	-0.00001
AK	1	0.0022	0.00219	-0.00001	-0.00001
VT	1	0.0022	0.00219	-0.00001	-0.00001
WY	1	0.0022	0.00219	-0.00001	-0.00001
DC	1	N/A	0.00219	N/A	N/A

Table 2.1

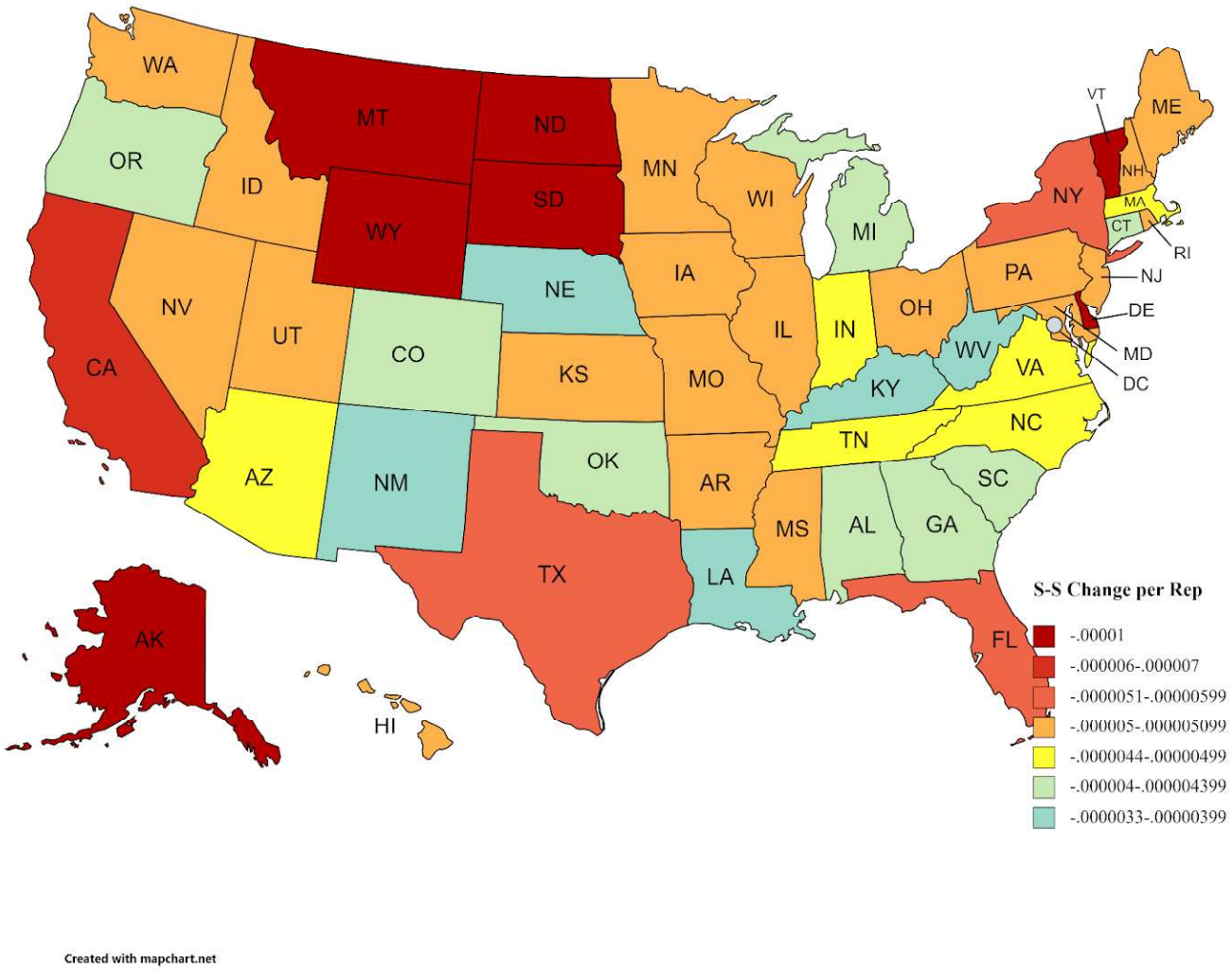

Figure 2.1

State by rep #	rep # desc	S-S (218control)	S-S (220 PR)	S-S Change	S-S Change/Rep
CA	53	0.13341	0.13212	-0.00129	-0.0000243
TX	36	0.08603	0.08525	-0.00078	-0.0000217
FL	27	0.06302	0.06246	-0.00056	-0.0000207
NY	27	0.06302	0.06246	-0.00056	-0.0000207
PA	18	0.0411	0.04075	-0.00035	-0.0000194

IL	18	0.0411	0.04075	-0.00035	-0.0000194
OH	16	0.03637	0.03605	-0.00032	-0.00002
GA	14	0.03167	0.0314	-0.00027	-0.0000193
MI	14	0.03167	0.0314	-0.00027	-0.0000193
NC	13	0.02934	0.02909	-0.00025	-0.0000192
NJ	12	0.02703	0.02679	-0.00024	-0.00002
VA	11	0.02472	0.02451	-0.00021	-0.0000191
WA	10	0.02242	0.02223	-0.00019	-0.000019
AZ	9	0.02013	0.01996	-0.00017	-0.0000189
MA	9	0.02013	0.01996	-0.00017	-0.0000189
TN	9	0.02013	0.01996	-0.00017	-0.0000189
IN	9	0.02013	0.01996	-0.00017	-0.0000189
MD	8	0.01786	0.01771	-0.00015	-0.0000188
MO	8	0.01786	0.01771	-0.00015	-0.0000188
WI	8	0.01786	0.01771	-0.00015	-0.0000188
MN	8	0.01786	0.01771	-0.00015	-0.0000188
CO	7	0.01559	0.01546	-0.00013	-0.0000186
SC	7	0.01559	0.01546	-0.00013	-0.0000186
AL	7	0.01559	0.01546	-0.00013	-0.0000186
LA	6	0.01333	0.01322	-0.00011	-0.0000183
KY	6	0.01333	0.01322	-0.00011	-0.0000183
OR	5	0.01109	0.01099	-0.0001	-0.00002
OK	5	0.01109	0.01099	-0.0001	-0.00002
CT	5	0.01109	0.01099	-0.0001	-0.00002
UT	4	0.00885	0.00878	-0.00007	-0.0000175
IA	4	0.00885	0.00878	-0.00007	-0.0000175
NV	4	0.00885	0.00878	-0.00007	-0.0000175
AR	4	0.00885	0.00878	-0.00007	-0.0000175
MS	4	0.00885	0.00878	-0.00007	-0.0000175
KS	4	0.00885	0.00878	-0.00007	-0.0000175

NM	3	0.00662	0.00657	-0.00005	-0.0000167
NE	3	0.00662	0.00657	-0.00005	-0.0000167
WV	3	0.00662	0.00657	-0.00005	-0.0000167
ID	2	0.00441	0.00437	-0.00004	-0.00002
HI	2	0.00441	0.00437	-0.00004	-0.00002
NH	2	0.00441	0.00437	-0.00004	-0.00002
ME	2	0.00441	0.00437	-0.00004	-0.00002
RI	2	0.00441	0.00437	-0.00004	-0.00002
MT	1	0.0022	0.00218	-0.00002	-0.00002
DE	1	0.0022	0.00218	-0.00002	-0.00002
SD	1	0.0022	0.00218	-0.00002	-0.00002
ND	1	0.0022	0.00218	-0.00002	-0.00002
AK	1	0.0022	0.00218	-0.00002	-0.00002
VT	1	0.0022	0.00218	-0.00002	-0.00002
WY	1	0.0022	0.00218	-0.00002	-0.00002
PR	4	N/A	0.00878	N/A	N/A

Table 2.2

These models turned out a bit more unusual. Major fluctuations between S-S Value change are seen across states. For example, in the DC+PR projection (Table 2.3), Representatives from Ohio and Rhode Island had identical losses in S-S power, despite Ohio having 10 times the population of Rhode Island. However, Representatives from Montana lost only 80% of the S-S power that those of Rhode Island lost, despite having nearly identical population numbers.

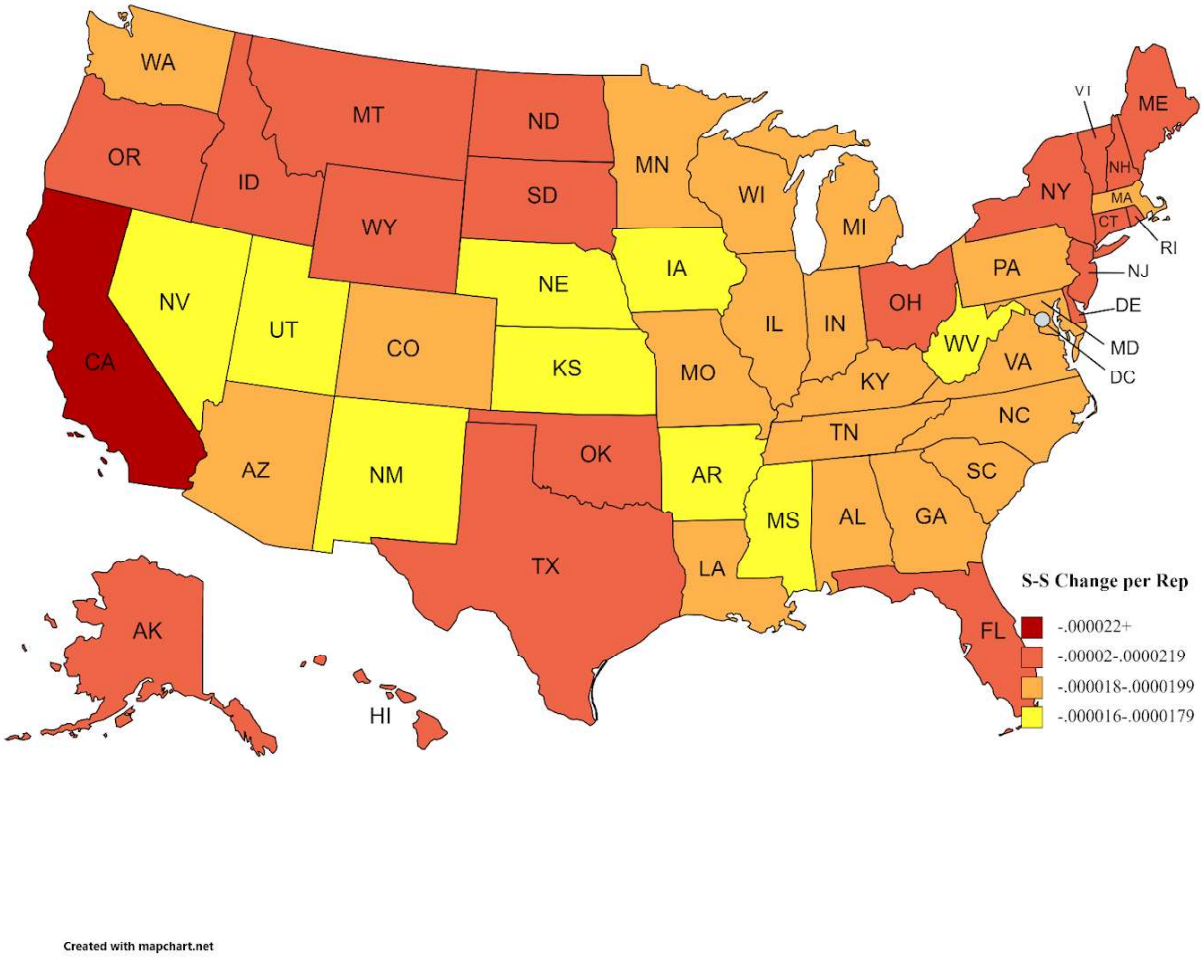

Figure 2.2

State by rep #	rep # desc	S-S (218control)	S-S (221 DC+PR)	S-S Change	S-S Change/Rep
CA	53	0.13341	0.1318	-0.00161	-0.0000304
TX	36	0.08603	0.08506	-0.00097	-0.0000269
FL	27	0.06302	0.06232	-0.0007	-0.0000259
NY	27	0.06302	0.06232	-0.0007	-0.0000259
PA	18	0.0411	0.04066	-0.00044	-0.0000244
IL	18	0.0411	0.04066	-0.00044	-0.0000244
OH	16	0.03637	0.03597	-0.0004	-0.000025

GA	14	0.03167	0.03133	-0.00034	-0.0000243
MI	14	0.03167	0.03133	-0.00034	-0.0000243
NC	13	0.02934	0.02903	-0.00031	-0.0000238
NJ	12	0.02703	0.02674	-0.00029	-0.0000242
VA	11	0.02472	0.02445	-0.00027	-0.0000245
WA	10	0.02242	0.02218	-0.00024	-0.000024
AZ	9	0.02013	0.01992	-0.00021	-0.0000233
MA	9	0.02013	0.01992	-0.00021	-0.0000233
TN	9	0.02013	0.01992	-0.00021	-0.0000233
IN	9	0.02013	0.01992	-0.00021	-0.0000233
MD	8	0.01786	0.01767	-0.00019	-0.0000237
MO	8	0.01786	0.01767	-0.00019	-0.0000237
WI	8	0.01786	0.01767	-0.00019	-0.0000237
MN	8	0.01786	0.01767	-0.00019	-0.0000237
CO	7	0.01559	0.01543	-0.00016	-0.0000229
SC	7	0.01559	0.01543	-0.00016	-0.0000229
AL	7	0.01559	0.01543	-0.00016	-0.0000229
LA	6	0.01333	0.01319	-0.00014	-0.0000233
KY	6	0.01333	0.01319	-0.00014	-0.0000233
OR	5	0.01109	0.01097	-0.00012	-0.000024
OK	5	0.01109	0.01097	-0.00012	-0.000024
CT	5	0.01109	0.01097	-0.00012	-0.000024
UT	4	0.00885	0.00876	-0.00009	-0.0000225
IA	4	0.00885	0.00876	-0.00009	-0.0000225
NV	4	0.00885	0.00876	-0.00009	-0.0000225
AR	4	0.00885	0.00876	-0.00009	-0.0000225
MS	4	0.00885	0.00876	-0.00009	-0.0000225
KS	4	0.00885	0.00876	-0.00009	-0.0000225
NM	3	0.00662	0.00656	-0.00006	-0.00002
NE	3	0.00662	0.00656	-0.00006	-0.00002

WV	3	0.00662	0.00656	-0.00006	-0.00002
ID	2	0.00441	0.00436	-0.00005	-0.000025
HI	2	0.00441	0.00436	-0.00005	-0.000025
NH	2	0.00441	0.00436	-0.00005	-0.000025
ME	2	0.00441	0.00436	-0.00005	-0.000025
RI	2	0.00441	0.00436	-0.00005	-0.000025
MT	1	0.0022	0.00218	-0.00002	-0.00002
DE	1	0.0022	0.00218	-0.00002	-0.00002
SD	1	0.0022	0.00218	-0.00002	-0.00002
ND	1	0.0022	0.00218	-0.00002	-0.00002
AK	1	0.0022	0.00218	-0.00002	-0.00002
VT	1	0.0022	0.00218	-0.00002	-0.00002
WY	1	0.0022	0.00218	-0.00002	-0.00002
DC	1	N/A	0.00218	N/A	N/A
PR	4	N/A	0.00876	N/A	N/A

Table 2.3

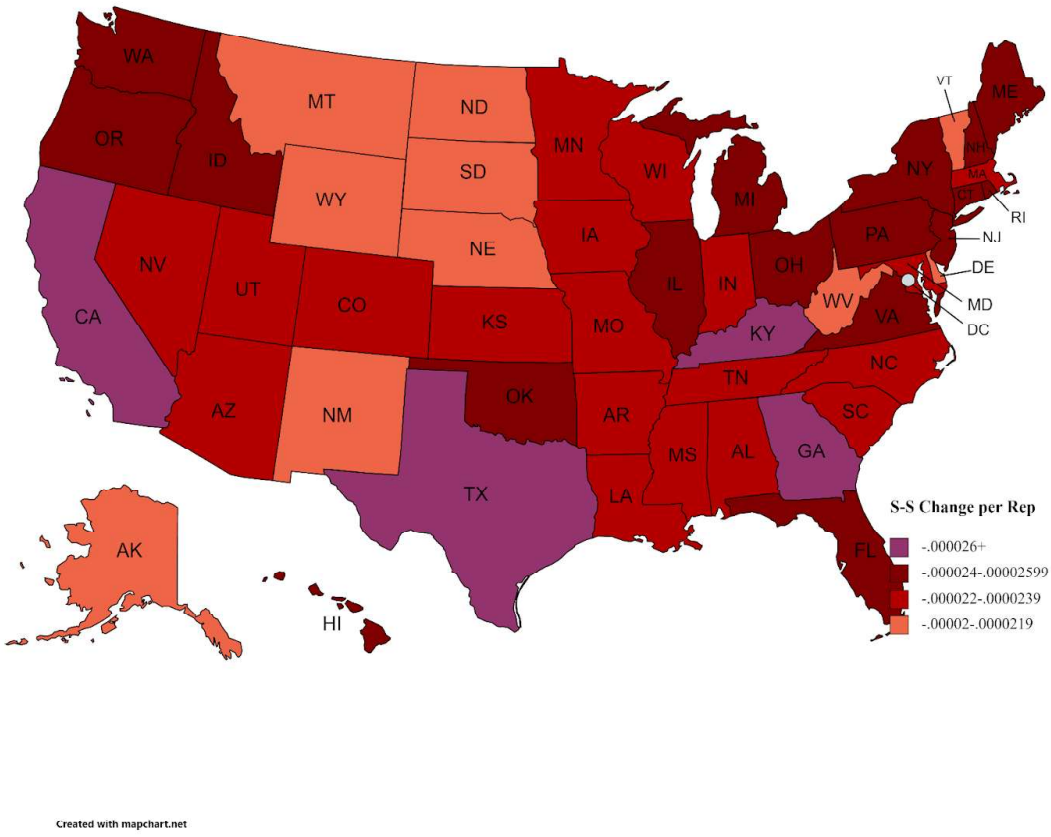

Figure 2.3

These disparities demonstrate that the largest impact of the stimuli on individual representatives is found at the margins between state representative numbers. Because the states follow the general trend in Model 1, Representatives whose neighboring states lose similar S-S power may individually feel the loss more compared to each other based on the fact that their state has 3 representatives rather than 2.

Additionally, it seems that some of the smallest states lose much more SSPI value by representative than by state compared to slightly larger states. Nebraska and Wyoming provide an illuminating example. Both states lost an identical amount of SSPI value despite Nebraska having three representatives and Wyoming having only one. Thus, when dividing the loss

between representatives, the representative in Wyoming lost three times as much power as a single Nebraskan representative. This difference is even more notable when you consider California's losses as the largest state by population. The state clearly lost the most SSPI value in all three simulations. However, each representative took a considerably smaller hit than the representatives in single representative states like Wyoming.

Lack of New Voter Paradox

One additional result to be drawn here is that the study affirms that in this instance, the House of Representatives is not subject to Steven Bram's "Paradox of New Members" (Brams 1976). This paradox appears when the addition of new members into a voting system has the effect of increasing the voting power of a previous member (Brams 1976). In this case, the addition of DC and Puerto Rico reduced the voting power of all states.

Additional Political Implications

In addition to the changes in SSPI value, the addition of DC and Puerto Rico affect other major aspects of the US political system. Notably, there would be 6 more electoral votes in presidential elections with the admission of Puerto Rico. These 6 votes would have been enough to shift the 2000 election to Al Gore if Puerto Rico was a state and voted Democratic.

DC is also a clear Democratic stronghold. DC has voted Democratic in every single presidential election since it was given electoral votes through the 23rd Amendment. Thus, the admission of DC as a state poses a clear threat to the GOP's legislative agenda.

These factors present additional context to consider when evaluating the impact of the changes in SSPI on voting behavior.

Additional Dimensions

The relationship between different demographic categories and SSPI change is evaluated in Figures 3.1, 3.2, and 3.3 below. All statistics are taken from US Census data, organized on a separate website.[6] Values for SSPI change by state use the combined DC and Puerto Rico metric.

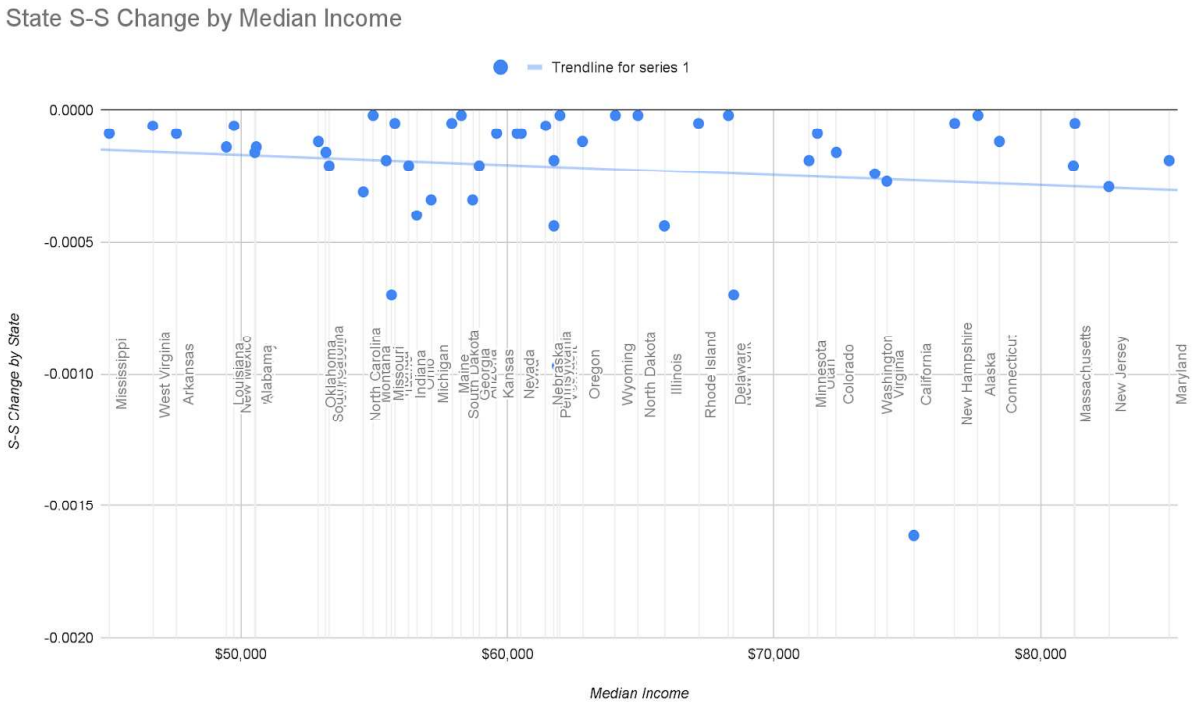

Figure 3.1

[6] https://worldpopulationreview.com/

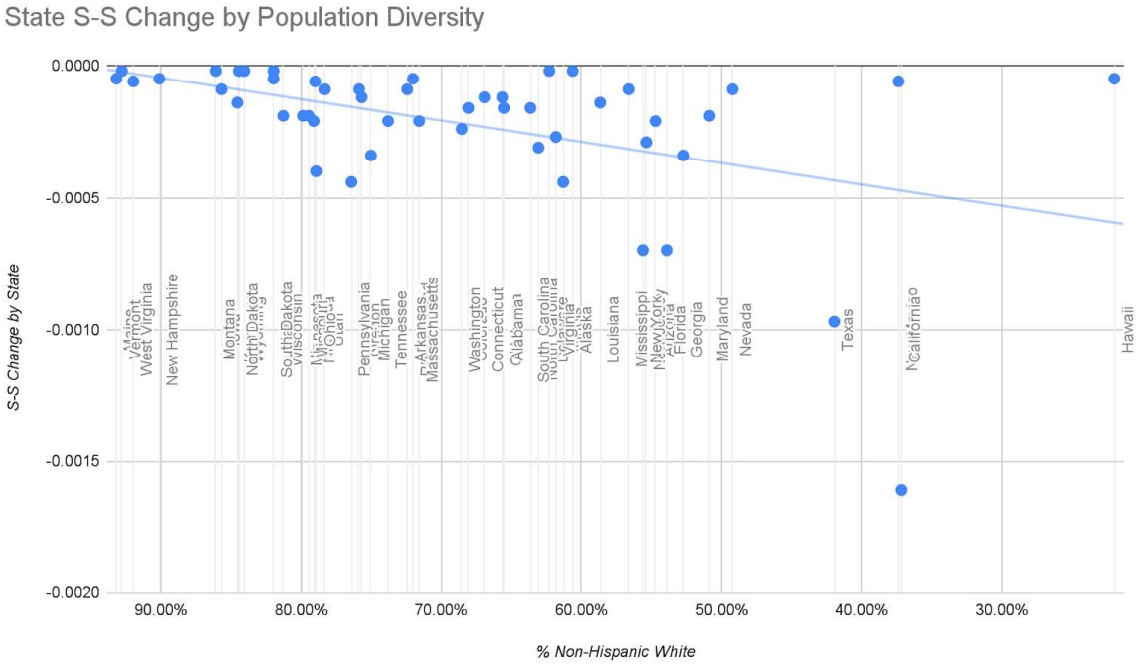

Figure 3.2

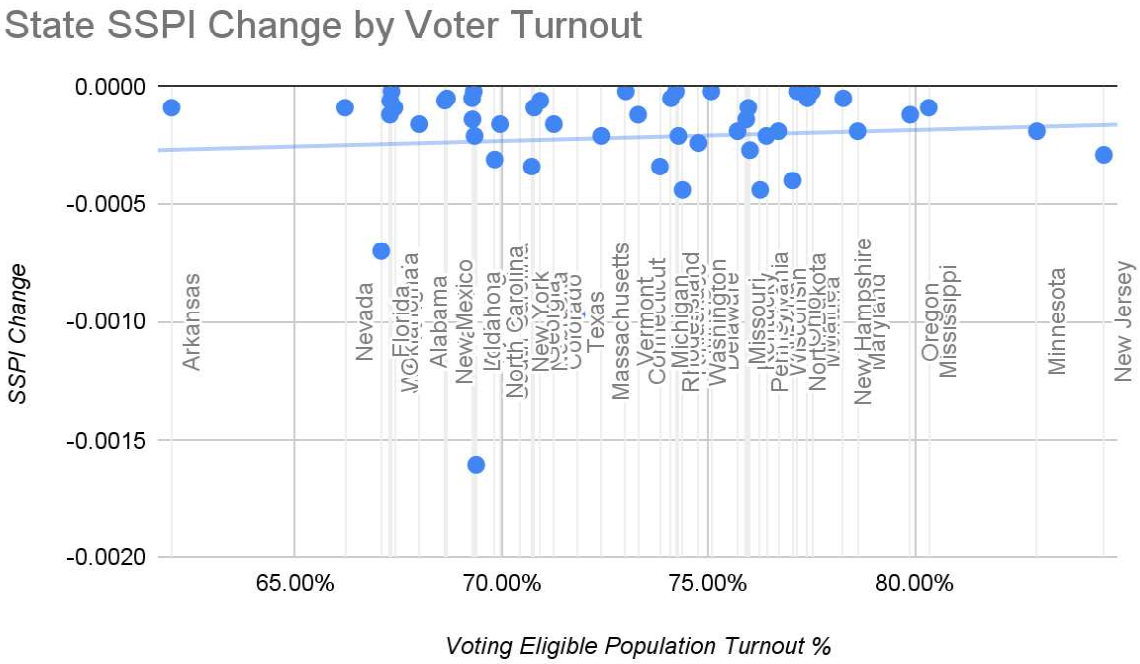

Figure 3.3

Median Income and Voter Turnout seem to have no relation to SSPI change once California is removed as an outlier. However, there appears to be a slight correlation between racial diversity and SSPI change. Racial diversity in Figure 3.2 is calculated based on non-hispanic whites as a percentage of total population.

Limitations

There are a number of limitations regarding the results of this study. The significance of the difference in SSPI value changes between states is qualified by their size. The values are proportionally much smaller than the overall SSPI value assigned to each state. Thus, the conclusions are limited in their significance.

Additionally, some scholars have questioned whether the use of the Shapley-Shubik Index is an accurate portrayal of political power. In the context of the modern political landscape, the amount of coalitions your vote is pivotal in may have little to no relevance at all. Partisan control of the legislature may be by far the most important factor with all others paling in comparison.

Additionally, the additional dimensions section is qualified by the precision of the calculations. Because the SSPI change is limited to two decimal places (except for California), the graphs are not very precise. This is due to a limitation in the PowerSlave Mk. II system, which only gives calculations to the hundred thousandth.

How to use this paper?

For researchers in political science, this paper may help explain the behavior of politicians. Alternatively, it may be used to highlight behavior that may appear strange in the context of this study (e.g., a Representative with a high S-S loss introducing a statehood bill). Just as Shapley and Shubik stated, the SSPI calculations can be used for this purpose. Most often, I would expect it to help isolate party loyalty as the dominant factor in statehood bill voting behavior.

For politicians and campaign strategists, this paper may provide useful information for developing policy preferences regarding statehood bills.

Conclusions

This paper breaks down the House of Representatives voting power change by factors that are likely not as significant as party identity. However, a better understanding of the political motivations of Representatives may be found through a comparative glance at the winners and losers of this study and their voting behavior in statehood bills. Shapleyn and Shubik predicted this use for SSPIs as well: “[T]he power index computations may be useful in the setting up of norms or standards, the departure from which will serve as a measure of, for example, political solidarity…”(Shapley and Shubik p. 791). Party loyalty seems to be a fitting explanation for behavior that breaks with SSPI expectations. After all, if they’re losing more power than others,

why are they voting for it? If they stand to gain, why would they vote against it? Party balance may indeed be the most vital factor of statehood votes.

Single representative states seem to be in the most unique position in the DC stimuli. Each of them has the unique position of being the sole voice for their state in the House of Representatives. In the lens of each representative acting alone, they lose the most power of the entire chamber. Additionally, the loss in SSPI power by representative is not a linear trend down with population. Their colleagues in 3-representative states all take smaller hits to SSPI power than do those in single, double, quadruple, and quintuple representative states.

References

Brams, Steven J., and Paul J. Affuso. "Power and size: A new paradox." *Theory and Decision* 7.1 (1976): 29-56.

Shapley, L. S., & Shubik, M. (1954). A Method for Evaluating the Distribution of Power in a Committee System. *The American Political Science Review*, *48*(3), 787–792. https://doi.org/10.2307/1951053

Schubert, G. A. (1958). The Study of Judicial Decision-Making as an Aspect of Political Behavior. *The American Political Science Review*, *52*(4), 1007–1025. https://doi.org/10.2307/1951981

"*The Federalist* Number 43, [23 January] 1788," *Founders Online,* National Archives, https://founders.archives.gov/documents/Madison/01-10-02-0248. [Original source: *The Papers of James Madison*, vol. 10, *27 May 1787–3 March 1788*, ed. Robert A. Rutland, Charles F. Hobson, William M. E. Rachal, and Frederika J. Teute. Chicago: The University of Chicago Press, 1977, pp. 411–418.]