Online Appendix

Polarization as a Function of Chamber Size

A Levels of Apportionment

State	Population	Expected Seats	Geometric Mean	Districts (217)	Expected Seats	Geometric Mean	Districts (871)
Alabama	4,779,736	3.280532601	3.464101615	3	13.46404507	13.49073756	13
Alaska	710,231	0.487461222	0	1	2.000650704	2.449489743	2
Arizona	6,392,017	4.387108442	4.472135955	4	18.00568169	18.49324201	18
Arkansas	2,915,918	2.001316404	2.449489743	2	8.213853521	8.485281374	8
California	37,253,956	25.56894715	25.49509757	26	104.9407211	104.4988038	105
Colorado	5,029,196	3.451747426	3.464101615	3	14.1667493	14.49137675	14
Connecticut	3,574,097	2.453052162	2.449489743	3	10.06787887	10.48808848	10
Delaware	897,934	0.616289636	0	1	2.529391549	2.449489743	3
Florida	18,801,310	12.90412491	12.489996	13	52.96143662	52.49761899	53
Georgia	9,687,653	6.649041181	6.480740698	7	27.28916338	27.49545417	27
Hawaii	1,360,301	0.933631435	0	1	3.831833803	3.464101615	4
Idaho	1,567,582	1.075897049	1.414213562	1	4.415723944	4.472135955	4
Illinois	12,830,632	8.806199039	8.485281374	9	36.14262535	36.49657518	36
Indiana	6,483,802	4.450104324	4.472135955	4	18.26423099	18.49324201	18
Iowa	3,046,355	2.090840769	2.449489743	2	8.58128169	8.485281374	9
Kansas	2,853,118	1.958214139	1.414213562	2	8.036952113	8.485281374	8
Kentucky	4,339,367	2.97828895	2.449489743	3	12.22356901	12.489996	12
Louisiana	4,533,372	3.11144269	3.464101615	3	12.77006197	12.489996	13
Maine	1,328,361	0.911709677	0	1	3.741861972	3.464101615	4
Maryland	5,773,552	3.962630062	3.464101615	4	16.26352676	16.4924225	16
Massachusetts	6,547,629	4.493911462	4.472135955	5	18.44402535	18.49324201	18
Michigan	9,883,640	6.783555251	6.480740698	7	27.84123944	27.49545417	28
Minnesota	5,303,925	3.640305422	3.464101615	4	14.9406338	14.49137675	15
Mississippi	2,967,297	2.036579959	2.449489743	2	8.358583099	8.485281374	8
Missouri	5,988,927	4.110450927	4.472135955	4	16.8702169	16.4924225	17
Montana	989,415	0.67907687	0	1	2.787084507	2.449489743	3
Nebraska	1,826,341	1.253494166	1.414213562	1	5.144622535	5.477225575	5
Nevada	2,700,551	1.85350103	1.414213562	2	7.607185915	7.483314774	8
New Hampshire	1,316,470	0.903548387	0	1	3.708366197	3.464101615	4
New Jersey	8,791,894	6.034244338	6.480740698	6	24.76589859	24.49489743	25
New Mexico	2,059,179	1.413300618	1.414213562	1	5.800504225	5.477225575	6
New York	19,378,102	13.30000137	13.49073756	13	54.58620282	54.49770637	55
North Carolina	9,535,483	6.544600549	6.480740698	7	26.86051549	26.4952826	27
North Dakota	672,591	0.461627316	0	1	1.894622535	1.414213562	2
Ohio	11,536,504	7.9179849	7.483314774	8	32.49719437	32.49615362	33
Oklahoma	3,751,351	2.574708991	2.449489743	3	10.56718592	10.48808848	11
Oregon	3,831,074	2.629426218	2.449489743	3	10.79175775	10.48808848	11
Pennsylvania	12,702,379	8.718173644	8.485281374	9	35.7813493	35.4964787	36
Rhode Island	1,052,567	0.722420728	0	1	2.964977465	2.449489743	3
South Carolina	4,625,364	3.174580645	3.464101615	3	13.02919437	13.49073756	13
South Dakota	814,180	0.558805765	0	1	2.293464789	2.449489743	2
Tennessee	6,346,105	4.355597117	4.472135955	4	17.87635211	17.49285568	18
Texas	25,145,561	17.25844955	17.49285568	17	70.8325662	70.49822693	71
Utah	2,763,885	1.896969801	1.414213562	2	7.785591549	7.483314774	8
Vermont	625,741	0.429472203	0	1	1.762650704	1.414213562	2
Virginia	8,001,024	5.4914372	5.477225575	6	22.53809577	22.49444376	23
Washington	6,724,540	4.615332876	4.472135955	5	18.9423662	18.49324201	19
West Virginia	1,852,994	1.271787234	1.414213562	1	5.219701408	5.477225575	5
Wisconsin	5,686,986	3.903216198	3.464101615	4	16.01967887	16.4924225	16
Wyoming	563,626	0.386840082	0	1	1.587678873	1.414213562	2

Table 1: Huntington-Hill District Counts for 217 and 871 Seat House.

B Technical Description of the Magleby-Mosesson Algorithm

The algorithm requires that an analyst represent a map as a graph G where a node v_i corresponds to a unit of geography, and an edge, $e_{(i,j)}$, correspond to shared boundaries between units i and j.

Step 1 ("Coarsening")

I transform a graph G_0 into a series of smaller graphs $G_1, G_2, G_3, \ldots, G_m$ where $|A_0| > |A_1| > |A_2| > |A_3| > \ldots > |A_m|$. The algorithm selects a vertex $u \in A_i$ with probability $1/n_i$ where $n_i = |A_i|$. If u has not been selected previously, then the algorithm *matches* u with $v \in V_i^u$ with probability $1/|V_i^u|$ where V_i^u is the set of unmatched vertices adjacent to u. If $\exists\, v \in V_i^u$, then the algorithm collapses u and v into a *multinode* $a_j \in A_{i+1}$. In G_{i+1}, the weight of the multinode, $w(a_j) = w(u) + w(v)$, and $E_{a_j} = E_u \cup E_v$. If $V_i^u = \emptyset$, then u remains unmatched. Unmatched vertices are copied over to G_{i+1}.

Step 2 ("Partitioning")

We compute a k-way partition P_m of graph G_m that divides V_m into k parts each containing $|A_m|/k$ vertices. The algorithm chooses a multinode $A_i \in A_m$ with probability $1/|A_m|$. It then chooses another block $u \in V_i^{A_i}$ with probability $1/|V_i^{A_i}|$ and combines the multinode into a district $P_m[v]$. If $w(u) + w(A_i) \geq 1/kW(A_m)$ or $w(u) + w(P_m[v]) \geq 1/kW(A_m)$, the algorithm stops adding multinode to the district. If $w(u) + w(A_i) < 1/2W(A_m)$ or $w(u) + w(P_m[v]) < 1/2W(A_m)$, then the algorithm repeats step 2; however, it chooses $u \in V_i^{P_m[v]}$ in every iteration after the first.

Step 3 ("Uncoarsening")

By going through a the set of intermediate partitions $P_{m-1}, P_{m-2}, \ldots, P_1, P_0$, the algorithm projects P_m of G_m back onto G_0. At every step of the uncoarsening process, the algorithm assigns $P_i[u] = P_{i+1}[v],\ \forall\, v \in V_i^u$.

Step 4 ("Refinement")

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Consider a partition that has two parts v and u. For each $P_{m-1}, P_{m-1}, \ldots, P_0$ in the uncoarsening step, let v and u be two parts of P_i. The algorithm selects $v'_{i+1} \subset v_{i+1}$ and $u'_{i+1} \subset u_{i+1}$ where v'_{i+1} is contiguous with u_{i+1} and u'_{i+1} is contiguous with v_{i+1}. If $|w(v_{i+1}) - w(u_{i+1})| > |w(v_{i+1} \setminus v'_{i+1} \cup u'_{i+1}) - w(u_{i+1} \setminus u'_{i+1} \cup v'_{i+1})|$ then it sets $v_i = v_{i+1} \setminus v'_{i+1} \cup u'_{i+1}$ and $u_i = u_{i+1} \setminus u'_{i+1} \cup v'_{i+1}$, otherwise $v_i = v_{i+1}$ and $u_i = u_{i+1}$.

Step 5 (“Repeat”)

If the resulting partition is a set of contiguous and balanced districts, I record the partition for later analysis. If not, the flawed partition is discarded and the algorithm restarts.