

**EXPERT REPORT OF JOWEI CHEN, Ph.D.**

I am an Associate Professor in the Department of Political Science at the University of Michigan, Ann Arbor. I am also a Faculty Associate at the Center for Political Studies of the Institute for Social Research at the University of Michigan as well as a Research Associate at the Spatial Social Science Laboratory at Stanford University. In 2007, I received a M.S. in Statistics from Stanford University, and in 2009, I received a Ph.D. in political science from Stanford University. I have published academic papers on political geography and districting in top political science journals, including *The American Journal of Political Science* and *The American Political Science Review*, and *Election Law Journal*. My academic areas of expertise include spatial statistics, redistricting, racial politics, legislatures, elections, and political geography. I have unique expertise in the use of geographic information systems (GIS) data to study questions related to political geography and redistricting.

I have provided expert reports in the following redistricting court cases: Missouri National Association for the Advancement of Colored People v. Ferguson-Florissant School District and St. Louis County Board of Election Commissioners (E.D. Mo. 2014); Rene Romo et al. v. Ken Detzner et al. (Fla. 2d Judicial Cir. Leon Cnty. 2013); The League of Women Voters of Florida et al. v. Ken Detzner et al. (Fla. 2d Judicial Cir. Leon Cnty. 2012); Raleigh Wake Citizens Association et al. v. Wake County Board of Elections (E.D.N.C. 2015); Corrine Brown et al. v. Ken Detzner et al. (N.D. Fla. 2015); City of Greensboro et al. v. Guilford County Board of Elections, (M.D.N.C. 2015); Common Cause et al. v. Robert A. Rucho et al. (M.D.N.C. 2016); League of Women Voters of Pennsylvania et al. v. Commonwealth of Pennsylvania et al. (No. 261 M.D. 2017). I have testified at trial in the following cases: Raleigh Wake Citizens Association et al. v. Wake County Board of Elections (E.D.N.C. 2015); City of Greensboro et al. v. Guilford County Board of Elections (M.D.N.C. 2015); Common Cause et al. v. Robert A. Rucho et al. (M.D.N.C. 2016); League of Women Voters of Pennsylvania et al. v. Commonwealth of Pennsylvania et al. (No. 261 M.D. 2017). I am being compensated \$250 per hour for my work in this case.

**Research Questions and Summary of Findings:**

The attorneys for the plaintiffs in this case have asked me to analyze House Districts 105 and 111 in the 2012 Georgia House districting plan, as created by Act No. 277 (S.B. 513) of

2012, and in the 2015 Georgia House districting plans, as created by Act No. 251 (2015 Ga. L. 1413) (H.B. 566) of 2015. Specifically, I was asked to analyze:

- 1) Whether there is racially polarized voting within HD 105 and HD 111 under the two plans;
- 2) What the partisan results of the House races in HD 105 and HD 111 would have been in November 2016 if these two House races had been held using the boundaries of the 2012 House districting plan (Act No. 277); and
- 3) Whether race predominated in the drawing of HD 105 and HD 111 under the 2015 plan.

I answered these questions by analyzing individual-level voter registration files, individual-level voter turnout history files, and precinct-level election results for Georgia's state house elections held in November 2012, 2014, and 2016. I also analyzed 2010 Census data describing the racial and ethnic breakdowns of Georgia's precincts and Census blocks, as well as shapefiles depicting the district boundaries within the 2012 and 2016 Plans.

In Georgia, residents are asked to select their racial identification when they register to vote. However, voters are not given the opportunity to select a partisan affiliation. Therefore, the publicly available voter registration list in Georgia contains information on the racial identification of each individual voter, along with the precinct and the House district in which each voter resides. I therefore analyzed this data in order to identify the number of voters of each racial identity residing within each precinct and within HD 105 and HD 111, as drawn by both the 2012 Plan and the 2015 Plans. Because Georgia voters are not asked to identify their partisan affiliation, it is not possible to obtain or analyze data regarding voter partisanship or election results at the sub-precinct level. In Georgia, election results are available only at the precinct level.

By analyzing these precinct-level data, I concluded that voters in both HD 105 and HD 111 exhibit significant racially polarized voting. In both districts, virtually all Black voters supported Democratic House candidates in the 2012, 2014, and 2016 House elections, while 75-85% of non-Black voters supported Republican candidates. Thus, race is an extremely strong proxy for partisanship in both districts.

Next, I estimated the hypothetical outcomes of the November 2016 House elections, assuming they had been held under the old 2012 Plan boundaries for HD 105 and HD 111. I found that, under the 2012 Plan boundaries, a Black Democratic candidate would have defeated a

White Republican candidate in November 2016, winning approximately 50.3%-54.4% of the vote in the two districts.

Finally, I analyzed the motivations for the redrawing of HD 105 and HD 111 in the 2015 plan. First, I found that the 2015 plan decreased the African-American share of the turnout electorate by 4.0 percentage points in HD 105 and by 2.9 percentage points in HD 111. Overall, in HD 105 and HD 111, the 2015 Plan generally decreased compliance with traditional districting principles and with the principles set forth in the “2011-2012 Guidelines for the House Legislative and Congressional Reapportionment Committee” (Hereinafter: “Redistricting Guidelines”). Given that race and partisanship are highly correlated within these two districts, I also sought to analyze whether partisan considerations, rather than racial considerations, could account for the drawing of the new district boundaries in the 2015 plan. I found that the Legislature’s primary map-drawer for the 2015 Plan had access only to racial data, but not partisan data, at the sub-precinct level. Yet strikingly, I also found that the 2015 Plan splits three precincts in HD 105 and five precincts in HD 111 in ways that consistently decreased the African-American share of the population in both districts. These two findings demonstrate that racial considerations, not partisanship, predominated in the drawing of the 2015 Plan boundaries within these eight split precincts.

This report proceeds as follows. First, I describe my analysis of racially polarized voting in HD 105 and HD 111. Second, I illustrate how increasing racial minority proportions caused a pro-Democratic shift during 2012 to 2016 within the 2012 Plan’s boundaries for HD 105 and 111. Third, I produce vote estimates of hypothetical November 2016 House elections held using the previous 2012 Plan boundaries. Fourth, I describe how the 2015 Plan made a series of changes to the boundaries of HD 105 and HD 111 that altered the racial composition of these districts by subordinating traditional districting principles, including principles set forth in the Redistricting Guidelines. Finally, I describe how the 2015 Plan’s boundaries for HD 105 and HD 111 within split precincts appears to have been driven by racial considerations.

### **Racially Polarized Voting Analysis**

To analyze whether there was racially polarized voting within HD 105 and HD 111 under the 2012 and 2015 Plans, I first calculated precinct-level racial breakdowns of the turnout electorate – the set of registered voters who cast ballots – within the boundaries of HD 105 and

HD 111 during the November 2012, 2014, and 2016 general elections. I then compared these precinct-level racial breakdowns to the precinct-level House election results for HD 105 and 111 during these three elections.

To estimate the partisan voting patterns of each racial group within each district, I use ecological inference (EI), a commonly-used and widely-accepted statistical technique for estimating different racial groups' political behavior when racial breakdowns of such behavior is not directly reported in publicly-available data. EI uses a procedure known as maximum likelihood estimation, combined with Duncan and Davis' (1953) method of bounds, to estimate the level support for a particular party's candidate among members of different racial groups across the different precincts contained within a district. The key advantage of EI is that it uses observed election results and racial data from all precincts within the district and estimates any differences across precincts in a particular racial group's voting behavior.

Table 1 reports the EI estimates of each racial group's tendency to support Democratic candidates during the November 2012, 2014, and 2016 House elections in HD 105, while Table 2 reports the EI estimates for HD 111. It is clear that both HD 105 and HD 111 exhibited significantly racially polarized voting during each of these three elections. In HD 105, approximately 98-99% of Black voters supported the Democratic candidate during the three elections, whereas only 19-25% of non-Black voters supported the Democratic candidate.

HD 111 exhibited a similar pattern of racially polarized voting during each of the three elections. Approximately 98-99% of Black voters supported the Democratic candidate during the 2012, 2014, and 2016 elections, whereas only 16-18% of non-Black voters supported the Democratic candidate.

**Table 1:  
Ecological Inference and Ecological Regression Estimates of Democratic Candidates' Share of Two-Party Vote Among Blacks and Non-Blacks in House District 105**

	<b>Ecological Inference Estimates</b>		<b>Ecological Regression Estimates:</b>	
	<b>Black</b>	<b>Non-Black</b>	<b>Black</b>	<b>Non-Black</b>
2012 House Election	99.0% [98.0%, 99.7%]	21.4% [21.0%, 22.0%]	100% [100%, 100%]	7.4% [0.4%, 10.3%]
2014 House Election	97.9% [93.3%, 99.6%]	19.2% [18.2%, 21.7%]	100% [100%, 100%]	6.6% [4.0%, 9.0%]
2016 House Election	99.3% [98.8%, 99.7%]	25.2% [25.0%, 25.4%]	100% [100%, 100%]	10.2% [7.8%, 12.6%]

[95% Confidence Intervals listed in brackets]

**Table 2:  
Ecological Inference and Ecological Regression Estimates of Democratic Candidates' Share of Two-Party Vote Among Blacks and Non-Blacks in House District 111:**

	<b>Ecological Inference Estimates</b>		<b>Ecological Regression Estimates:</b>	
	<b>Black</b>	<b>Non-Black</b>	<b>Black</b>	<b>Non-Black</b>
2012 House Election	98.2% [90.1%, 99.8%]	18.1% [17.2%, 20.4%]	100% [100%, 100%]	8.0% [6.0%, 10.0%]
2014 House Election	98.6 % [94.9%, 99.8%]	15.7% [14.9%, 17.9%]	100% [100%, 100%]	7.4% [5.4%, 9.5%]
2016 House Election	99.3% [98.6%, 99.8%]	17.8% [17.5%, 18.1%]	100% [100%, 100%]	7.6% [5.3%, 10.0%]

[95% Confidence Intervals listed in brackets]

### **Demographic and Partisan Changes in HD 105 and HD 111 under the 2012 Plan**

Having found that HD 105 and HD 111 both exhibited racially polarized voting in the 2012, 2014, and 2016 House elections, I next analyzed the racial composition and partisan performance of the two districts, as drawn by the 2012 Plan. Overall, my analysis revealed three findings:

1) The African-American share of the turnout electorate increased noticeably from November 2012 to November 2016 in both HD 105 and HD 111 under the 2012 Plan.

2) Non-African-American voters within HD 105, as drawn under the 2012 Plan, became somewhat more likely to favor a Black Democratic House candidate in November 2016, compared to previous elections.

3) As a result of these racial and partisan shifts, Democratic House candidates' vote share significantly increased among voters residing within the 2012 Plan boundaries for HD 105 and HD 111 from November 2012 to November 2016.

Below, I describe and illustrate these three findings in greater detail:

First, both HD 105 and HD 111, as drawn under the 2012 Plan, became more heavily African-American from 2014 to 2016. This increasing African-American share of the electorate within the 2012 Plan's HD 105 boundaries is illustrated in Table 3, which shows that African-Americans comprised 35.2% of the Election Day turnout in November 2012, 35.7% in November 2014, and 37.0% by November 2016 (counting only voters who reside within the 2012 Plan's HD 105 boundaries). Table 4 illustrates an even more significant increase in African-American share of the electorate within the 2012 Plan's HD 111 boundaries: African-Americans comprised 36.1% of the Election Day turnout in November 2012, 37.6% in November 2014, and 40.3% by November 2016 (counting only voters who reside within the 2012 Plan's HD 111 boundaries). During all three elections, voters in both districts exhibited significant racially polarized voting patterns, with African-Americans favoring Democratic House candidates at a rate of around 98-99%. Thus, it is clear that this demographic pattern of increasing African-American population within the 2012 Plan's HD 105 and HD 111 boundaries would have caused a substantial increase in Democratic vote share by the November 2016 House elections in both districts.

**Table 3:  
HD 105 Precinct-Level Voter Turnout by Race under the 2012 and 2015 Plans**

Pct:	Precinct Name:	2012 Election Turnout Within HD 105 Boundaries (2012 Plan)		2014 Election Turnout Within HD 105 Boundaries (2012 Plan)		2016 Election Turnout Within HD 105 Boundaries (2012 Plan)		2016 Election Turnout Within HD 105 Boundaries (2015 Plan)	
		Black	Non-Black	Black	Non-Black	Black	Non-Black	Black	Non-Black
001	Harbins A							329*	1651*
060	Lawrenceville D	897*	705*	474*	379*	938*	893*	1088*	933*
071	Lawrenceville F	1083	1067	734	706	1143	1203	1143	1203
078	Baycreek K	488	1520	387	1009	681	1677	681	1677
080	Baycreek C	1149	2169	794	1492	1463	2394	1463	2394
091	Baycreek D	585	2130	433	1470	744	2204	744	2204
134	Baycreek F	845	1366	587	956	1105	1563	1105	1563
144	Lawrenceville M	1233*	1152*	865*	681*	1490*	1525*		
146	Baycreek H	333*	1997*	246*	1396*	468*	2096*	468*	2096*
147	Baycreek I	973	1869	660	1246	1173	2110	1173	2110
151	Harbins C							249	1367
	Totals by Race:	7,586 (35.2%)	13,975 (64.8%)	5,180 (35.7%)	9,335 (64.3%)	9,199 (37.0%)	15,660 (63.0%)	8,443 (32.9%)	17,198 (67.1%)
	Totals:	21,561		14,515		24,945		25,641	

\* Indicates that the precinct was split into multiple districts, including House District 105. Only those voters residing within HD 105 are included in this table's turnout numbers. In particular, note that the HD 105 portion of Lawrenceville D was different under the 2012 plan than under the 2015 plan. Therefore, the November 2016 turnout numbers for Lawrenceville D within HD 105 are different under the 2012 plan and under the 2015 plan



**Table 4:  
HD 111 Precinct-Level Voter Turnout by Race under the 2012 and 2015 Plans**

Precinct Name:	2012 Election Turnout Within HD 111 Boundaries (2012 Plan)		2014 Election Turnout Within HD 111 Boundaries (2012 Plan)		2016 Election Turnout Within HD 111 Boundaries (2012 Plan)		2016 Election Turnout Within HD 111 Boundaries (2015 Plan)	
	Black	Non-Black	Black	Non-Black	Black	Non-Black	Black	Non-Black
26 - Tussahaw							25*	498*
29 - Lowes	1539	2516	1148	1669	2146	2823	2146	2823
31 - North Hampton	505*	1208*	395*	823*	659*	1240*		
32 - Mount Carmel	949	1004	831	725	1517	1196	1023*	803*
34 - Wesley Lakes	1505	1436	993	947	1653	1463	1653	1463
35 - McDonough							534	611
38 - Hickory Flat							795*	583*
40 - Stockbridge West	1570	777	1093	429	1690	750		
41 - Stagecoach	703	1298	505	849	735	1253		
48 - Unity Grove	328	2203	228	1596	386	2567	386	2567
50 - Pates Creek	991	2186	738	1515	1265	2096	1265	2096
51 - Oakland	591	1786	509	1355	911	1850	911	1850
53 - Flippen							884*	1106*
57 - Dutchtown	351	1372	273	973	425	1339	425	1339
59 - Grove Park							445	1559
61 - McDonough Central	288*	731*	185*	562*	348*	775*	302*	759*
Totals by Race:	9,320 (36.1%)	16,517 (63.9%)	6,898 (37.6%)	11,443 (62.4%)	11,735 (40.3%)	17,352 (59.7%)	10,794 (37.4%)	18,057 (62.6%)
Totals:	25,837		18,341		29,087		28,851	

\* Indicates that the precinct was split into multiple districts, including House District 111. Only those voters residing within HD 111 are included in this table's turnout numbers

Second, the non-African-American portion of the electorate in HD 105 exhibited a noticeable increase in its support for a Black Democratic candidate in November 2016, compared to earlier elections. This increase in Democratic support is illustrated by the Ecological Inference estimates in Table 1, which predict that non-Blacks support for a Black Democratic candidate increased from 21.4% in November 2012 to 25.2% in November 2016. This increase is partially attributable to an increase in the Hispanic and Asian shares of the non-Black portion of the electorate in HD 105, illustrated in Table 7, as Hispanic and Asian voters were more likely than non-Hispanic white voters to support Black Democratic candidates.

As a result of these two demographic shifts within the 2012 Plan's HD 105 and HD 111 – the increase in African-Americans and other Democratic-supporting minority populations – both districts would have exhibited a substantial increase in Democratic vote share in the November 2016 House elections, if not for the 2015 Plan's redrawing of the two districts' boundaries.

This pro-Democratic shift within the 2012 Plan's HD 105 and HD 111 boundaries is clearly seen in Tables 5 and 6. These Tables show the actual precinct-level House election vote counts for only those precincts that were assigned to HD 105 or HD 111 and whose district boundaries were identical under both the 2012 and the 2015 Plans. In other words, these precincts are the ones whose House district assignments were unaffected by the 2015 Plan redistricting. There were seven such precincts in HD 105 (Table 5) and six such precincts in HD 111 (Table 6).

Table 5 illustrates that all seven precincts in HD 105 that were unaffected by the 2015 Plan substantially increased their Democratic vote shares in House elections from November 2012 to 2016; in fact, all seven precincts increased their Democratic vote share from November 2014 to 2016. For example, voters in Precinct 71 (Lawrenceville F) supported Democrat Renita Hamilton at a 66.7% rate in November 2012 and 2014, but by November 2016, the precinct's support for the Democratic candidate (Donna McLeod) increased to 70.2%. Overall, all seven precincts increased their respective Democratic vote shares by a margin of 3.5 to 9.6 percentage points between November 2012 and 2016.

**Table 5:  
House Election Results in Precincts in which HD 105 Boundaries Remained Unchanged from the 2012 Plan to the 2015 Plan**

	2012 Election Results (HD 105)		2014 Election Results (HD 105)		2016 Election Results (HD 105)	
Precinct Name:	Renita Hamilton (Black Democrat)	Joyce Chandler (White Republican)	Renita Hamilton (Black Democrat)	Joyce Chandler (White Republican)	Donna McLeod (Black Democrat)	Joyce Chandler (White Republican)
71-Lawrenceville F	1369	682	937	467	1571	667
78-Baycreek K	683	1224	519	851	1018	1236
80-Baycreek C	1496	1662	1017	1229	1999	1701
91-Baycreek D	898	1712	604	1262	1137	1702
134-Baycreek F	1039	1086	727	788	1495	1060
146-Baycreek H	542	1703	398	1215	817	1665
147-Baycreek I	1299	1407	878	988	1712	1449

	2012 Election Results (HD 105)		2014 Election Results (HD 105)		2016 Election Results (HD 105)	
Precinct Name:	Democratic Candidate Vote Share		Democratic Candidate Vote Share		Democratic Candidate Vote Share	
71-Lawrenceville F	66.7%		66.7%		70.2%	
78-Baycreek K	35.8%		37.9%		45.2%	
80-Baycreek C	47.4%		45.3%		54.0%	
91-Baycreek D	34.4%		32.4%		40.0%	
134-Baycreek F	48.9%		48.0%		58.5%	
146-Baycreek H	24.1%		24.7%		32.9%	
147-Baycreek I	48.0%		47.1%		54.2%	

\* Only includes precincts in which the boundaries of HD 105 did not change from the 2012 to the 2015 Plan.

**Table 6:  
House Election Results in Precincts in which HD 111 Boundaries Remained Unchanged from the 2012 Plan to the 2015 Plan**

	<b>2012 Election Vote Counts (HD 111)</b>		<b>2014 Election Vote Counts (HD 111)</b>		<b>2016 Election Vote Counts (HD 111)</b>	
Precinct Name:	Bill Blackmon (Black Democrat)	Brian Strickland (White Republican)	Jim Nichols (White Democrat)	Brian Strickland (White Republican)	Darryl Payton (Black Democrat)	Brian Strickland (White Republican)
29 - Lowes	1934	2083	1356	1439	2602	2283
34 - Wesley Lakes	1798	1029	1176	718	1991	1054
48 - Unity Grove	513	1911	361	1428	621	2264
50 - Pates Creek	1307	1739	954	1238	1613	1628
51 - Oakland	780	1445	644	1165	1124	1532
57 - Dutchtown	520	1128	373	842	614	1095

	<b>2012 Election Results (HD 111)</b>	<b>2014 Election Results (HD 111)</b>	<b>2016 Election Results (HD 111)</b>
Precinct Name:	Democratic Candidate Vote Share	Democratic Candidate Vote Share	Democratic Candidate Vote Share
29 - Lowes	48.1%	48.5%	53.3%
34 - Wesley Lakes	63.6%	62.1%	65.4%
48 - Unity Grove	21.2%	20.2%	21.5%
50 - Pates Creek	42.9%	43.5%	49.8%
51 - Oakland	35.1%	35.6%	42.3%
57 - Dutchtown	31.6%	30.7%	35.9%

\* Only includes precincts in which the boundaries of HD 105 did not change from the 2012 to the 2015 Plan.

Table 6 illustrates a similar pro-Democratic pattern for the six precincts in HD 111 that were unaffected by the 2015 Plan: All six precincts substantially increased their Democratic vote shares in House elections from November 2012 to 2016; all six precincts also increased their Democratic vote share from November 2014 to 2016. For example, voters in Precinct 29 (Loves) supported the Democratic House candidate at a 48.1% rate in November 2012 and a 48.5% rate in 2014, but by November 2016, the precinct's support for the Democratic candidate (Darryl Payton) increased to 53.3%. Overall, all six precincts increased their respective Democratic vote shares by a margin of 0.3 to 6.9 percentage points between November 2012 and 2016.

Overall, these two Tables illustrate that HD 105 and 111, as drawn by the 2012 Plan, would have exhibited a substantial increase in Democratic vote share in the November 2016 House elections, if not for the 2015 Plan's redrawing of the two districts' boundaries. Among the seven unaffected precincts in HD 105, the Black Democratic candidate's vote share increased by 7.1 percentage points from November 2012 to November 2016. Among the six unaffected precincts in HD 111, the Black Democratic candidate's vote share increased by 4.2 percentage points from November 2012 to November 2016. These changes in the unaffected portions of HD 105 and 111 are attributable primarily to the increasing minority proportions of the electorate within the two districts' boundaries under the 2012 Plan.

Given that voting patterns in these two districts are highly racially polarized, it is not surprising that these partisan shifts coincided with racial shifts in the composition of the electorate. Tables 7 and 8 show how the partisan shifts within the 2012 Plan's boundaries for HD 105 and 111 are clearly attributable to the increasing African-American, Hispanic, and Asian proportions of the electorate within the two districts' boundaries under the 2012 Plan. For HD 105, Table 7 lists the racial breakdown of voters residing in the 2012 Plan's HD 105 boundaries who turned out to vote in November 2012, 2014, and 2016. The final column then lists the racial breakdown of November 2016 voters who turned out and who resided within the new HD 105 boundaries, as drawn by the 2015 Plan. Table 8 shows the analogous calculations for HD 111, as drawn by the 2012 and the 2015 Plans.

**Table 7:  
HD 105 District-Wide Turnout by Race under the 2012 and 2015 Plans**

<b>Racial Group:</b>	<b>2012 Election Turnout Within HD 105 Boundaries (2012 Plan)</b>	<b>2014 Election Turnout Within HD 105 Boundaries (2012 Plan)</b>	<b>2016 Election Turnout Within HD 105 Boundaries (2012 Plan)</b>	<b>2016 Election Turnout Within HD 105 Boundaries (2015 Plan)</b>
White	10,885 (50.5%)	7,468 (51.5%)	10,800 (43.4%)	12,554 (49%)
Black (non-Hispanic)	7,586 (35.2%)	5,180 (35.7%)	9,199 (37%)	8443 (32.9%)
Hispanic	747 (3.5%)	372 (2.6%)	1397 (5.6%)	1178 (4.6%)
Asian or Pacific Islander	348 (1.6%)	175 (1.2%)	603 (2.4%)	552 (2.2%)
American Indian or Alaskan Native	10 (0%)	7 (0%)	17 (0.1%)	22 (0.1%)
Other or Unknown	1,985 (9.2%)	1,313 (9.0%)	2,843 (11.4%)	2,892 (11.3%)
<b>Total Turnout:</b>	<b>21,561</b>	<b>14,515</b>	<b>24,859</b>	<b>25,641</b>

\* Indicates that the precinct was split into multiple districts, including House District 105. Only those voters residing within HD 105 are included in this table's turnout numbers. In particular, note that the HD 105 portion of Lawrenceville D was different under the 2012 plan than under the 2015 plan. Therefore, the November 2016 turnout numbers for Lawrenceville D within HD 105 are different under the 2012 plan and under the 2015 plan.

**Table 8:  
HD 111 District-Wide Turnout by Race under the 2012 and 2015 Plans**

<b>Racial Group:</b>	<b>2012 Election Turnout Within HD 111 Boundaries (2012 Plan)</b>	<b>2014 Election Turnout Within HD 111 Boundaries (2012 Plan)</b>	<b>2016 Election Turnout Within HD 111 Boundaries (2012 Plan)</b>	<b>2016 Election Turnout Within HD 111 Boundaries (2015 Plan)</b>
White	13,349 (51.7%)	9,422 (51.4%)	13,251 (45.6%)	13,836 (48.0%)
Black (non-Hispanic)	9,320 (36.1%)	6,898 (37.6%)	11,735 (40.3%)	10,794 (37.4%)
Hispanic	463 (1.8%)	259 (1.4%)	692 (2.4%)	679 (2.4%)
Asian or Pacific Islander	235 (0.9%)	113 (0.6%)	379 (1.3%)	436 (1.5%)
American Indian or Alaskan Native	1 (0%)	0 (0%)	10 (0%)	8 (0%)
Other or Unknown	2,469 (9.6%)	1,649 (9.0%)	3,020 (10.4%)	3,098 (10.7%)
<b>Total Turnout:</b>	<b>25,837</b>	<b>18,341</b>	<b>29,087</b>	<b>28,851</b>

\* Indicates that the precinct was split into multiple districts, including House District 111. Only those voters residing within HD 111 are included in this table's turnout numbers.

Together, these Tables illustrate a similar pattern in both districts. From November 2012 to 2016, each racial group's share of the total election-day turnout increased significantly within the 2012 Plan's HD 105 boundaries: African-Americans increased from 35.2% to 37%, Hispanics increased from 3.5% to 5.6%, and Asians increased from 1.6% to 2.4%. Similarly, within the 2012 Plan's HD 111 boundaries, each racial group's share of the total election-day turnout also increased significantly from November 2012 to 2016: African-Americans increased from 36.1% to 40.3%, Hispanics increased from 1.8% to 2.4%, and Asians increased from 0.9% to 1.3%. These increases in racial minority population explain why every single precinct that remained within HD 105 and 111 in both the 2012 Plan and the 2015 Plan exhibited a noticeable increase in Democratic candidate vote share in the 2016 House elections, as compared to the 2012 House elections.

Moreover, Tables 7 and 8 also illustrate how this trend of increasing racial minority populations in HD 105 and 111 was successfully reversed by the 2015 Plan's redrawing of the two districts. Within the 2012 Plan's boundaries for HD 105, the November 2016 turnout electorate consisted of 37% African-American voters and 5.6% Hispanic voters. But within the 2015 Plan's new boundaries for HD 105, the November 2016 turnout electorate consisted of only 32.9% African-Americans and 4.6% Hispanics. A similar reversal occurred in HD 111: Within the 2012 Plan's boundaries for HD 111, the November 2016 turnout electorate consisted of 40.3% African-American voters. But within the 2015 Plan's new boundaries for HD 111, the November 2016 turnout electorate consisted of only 37.4% African-Americans. By redrawing the boundaries of HD 105 and 111, the 2015 Plan decreased the racial minority proportions of the electorate, thus reversing the demographic changes that had occurred within the 2012 Plan's boundaries for HD 105 and 111 in recent years.

#### **Estimate of November 2016 Election Results Under 2012 Plan Boundaries**

Next, I estimated what the partisan results of the House races in HD 105 and HD 111 would have been in November 2016 if these two House races had been held using the boundaries of the 2012 House districting plan (Act No. 277). Specifically, I assumed that the set of election-day voters would have been exactly the same as the voters who actually turned out in November 2016. In total, I identified a total of 23,696 voters in HD 105 and 29,087 who satisfy the following two criteria:



1. The voter cast a ballot in the November 2016 General Election.
2. As of November 2016, the voter resided within the 2012 Plan boundaries of HD 105 or HD 111.

I then used this set of voters, along with their respective racial identifications on their voter registrations, to construct estimates of hypothetical November 2016 House election outcomes within the borders of HD 105 and HD 111 of the 2012 Plan. Specifically, I use Ecological Inference (EI) to derive predicted voting patterns by race and to estimate the rate at which voters cast ballots in House elections. Because the November 2016 elections included a US presidential race, and because turnout levels differ significantly between presidential and non-presidential elections, I use the November 2012 House election results and precinct-level turnout counts by race in order to derive precinct-level EI estimates about racial voting patterns. I then apply these racial voting estimates to precinct-level turnout counts by racial group in November 2016 in order to estimate how many votes would have been cast for each party's candidate in each precinct.

The November 2012 House elections featured a Black Democratic candidate and a White Republican candidate in both the HD 105 (Renita Hamilton and Joyce Chandler) and HD 111 (Brian Strickland and Bill Blackmon) races, which were held using the boundaries of the 2012 Plan. Thus the EI estimates derived using the results of this election give us reliable predictions regarding the racial voting patterns within each precinct in a House election featuring a Black Democratic and White Republican candidate during a presidential election year.

Table 9 reports the EI estimates for HD 105, while Table 10 reports the EI estimates for HD 111. The first row of Table 9 reports, for example, that African-American voters in Gwinnett County's Precinct 60 ("Lawrenceville D") who turn out to vote exhibit a roll-off rate of 8.3%, meaning that 91.7% of those who turn out are expected to cast a vote in their House race; Among those who cast a vote, 98.2% are expected to vote for a Black Democratic candidate. Meanwhile, only 44.7% of non-Black voters in Precinct 60 would have supported a Black Democratic candidate.

**Table 9:  
EI-Based Estimates of Hypothetical 2016 Election Results Within the Boundaries of HD 105 from the 2012 House Plan**

	<b>EI Estimates of Voter Roll-Off within HD 105 Boundaries from the 2012 House Plan</b>		<b>EI Estimates within HD 105 Boundaries from the 2012 House Plan</b>		<b>EI-Based Estimates of Democratic Votes in November 2016 within HD 105 Boundaries from the 2012 House Plan</b>	
Precinct Name:	<b>EI Estimates of Black Voter Roll-Off:</b>	<b>EI Estimates of Non-Black Voter Roll-Off:</b>	<b>EI Estimates of Black Voter Support for a Black Democratic Candidate:</b>	<b>EI Estimates of Non-Black Voter Support for a Black Democratic Candidate:</b>	<b>EI-based Estimate of Nov. 2016 Votes for a Black Democratic Candidate:</b>	<b>EI-based Estimate of Nov. 2016 Votes for a White Republican Candidate:</b>
60-Lawrenceville D *	8.3%	3.5%	98.2%	44.7%	1230	492
71-Lawrenceville F	6.2%	3.0%	98.2%	35.9%	1472	768
78-Baycreek K	8.6%	3.9%	97.4%	17.0%	880	1354
80-Baycreek C	7.5%	3.4%	97.9%	21.8%	1828	1838
91-Baycreek D	6.6%	3.1%	98.1%	17.5%	1056	1774
134-Baycreek F	5.6%	2.8%	98.8%	19.5%	1316	1245
144-Lawrenceville M*	6.9%	3.2%	98.2%	39.6%	1940	913
146-Baycreek H *	6.8%	3.1%	98.2%	12.3%	677	1789
147-Baycreek I	7.5%	3.3%	97.9%	23.1%	1534	1590
					<b>Total Estimated Votes for a Black Democratic Candidate:</b>	<b>Total Estimated Votes for a White Republican Candidate:</b>
					11,933	11,763

\* Indicates that the precinct was split into multiple districts, including House District 105. Only those voters residing within HD 105 are included in the EI estimates and estimated vote totals reported in this Table. Note that an extremely small portion of precinct "Baycreek G" also lies within HD 105 from the 2012 Plan. However, there were no registered voters within this portion, so Baycreek G is not listed on this Table.

**Table 10:  
EI-Based Estimates of Hypothetical 2016 Election Results Within the Boundaries of HD 111 from the 2012 House Plan**

	<b>EI Estimates of Voter Roll-Off within HD 111 Boundaries (2012 Plan)</b>		<b>EI Estimates within HD 111 Boundaries from the 2012 House Plan</b>		<b>EI-Based Estimates of Democratic Votes in November 2016 within HD 111 Boundaries from the 2012 House Plan</b>	
Precinct Name:	<b>EI Estimates of Black Voter Roll-Off:</b>	<b>EI Estimates of Non-Black Voter Roll-Off:</b>	<b>EI Estimates of Black Voter Support for a Black Democratic Candidate:</b>	<b>EI Estimates of Non-Black Voter Support for a Black Democratic Candidate:</b>	<b>EI-based Estimate of Nov. 2016 Votes for a Black Democratic Candidate:</b>	<b>EI-based Estimate of Nov. 2016 Votes for a White Republican Candidate:</b>
29 - Lowes	1.0%	0.9%	98.5%	17.3%	2603	2366
31 - North Hampton*	3.1%	3.9%	98.3%	12.3%	803	1096
32 - Mount Carmel	1.4%	1.9%	98.7%	23.2%	1776	937
34 - Wesley Lakes	3.2%	4.6%	98.8%	26.2%	2023	1093
40 - Stockbridge West	4.6%	5.5%	99.2%	41.2%	1988	452
41 - Stagecoach	3.5%	5.3%	98.7%	20.0%	982	1006
48 - Unity Grove	3.4%	4.3%	98.8%	9.5%	628	2325
50 - Pates Creek	3.0%	4.6%	98.6%	17.2%	1617	1744
51 - Oakland	4.6%	7.0%	98.4%	13.5%	1156	1605
57 - Dutchtown	3.5%	4.6%	98.4%	14.3%	611	1153
61 - McDonough Central*	3.6%	5.1%	98.4%	13.1%	447	676
					<b>Total Estimated Votes for a Black Democratic Candidate:</b>	<b>Total Estimated Votes for a White Republican Candidate:</b>
					14,634	14,453

\* Indicates that the precinct was split into multiple districts, including House District 111. Only those voters residing within HD 111 of the 2012 Plan are included in the EI estimates and estimated vote totals reported in this Table.

From these EI estimates, I am able to predict that Precinct 60 would have produced a total of 1,230 votes for a Black Democratic candidate and 492 votes for a White Republican candidate. Note that Precinct 60 was split by the 2012 Plan into HD 104 and HD 105, and this EI analysis considers only voters who resided, as of November 2016, within the boundaries of HD 105 from the 2012 Plan.

Applying this methodology to all precincts within the two districts, I find that both HD 105 and HD 111 would have been won by a Black Democratic candidate in November 2016 if these House races had been held using the boundaries of the 2012 Plan. Specifically, as Table 9 illustrates, voters in HD 105 would have favored the Democratic over the Republican candidate by 11,933 to 11,763 votes. Meanwhile, voters in HD 111 would have favored the Democratic over the Republican candidate by 14,634 to 14,453 votes, as illustrated in Table 10.

Yet even these EI estimates likely under-estimate the number of Democratic voters residing within both districts as of November 2016. The EI estimates used in Tables 9 and 10 are based on voting patterns observed in the November 2012 House elections. From 2014 to 2016, these voting patterns shifted noticeably in a pro-Democratic direction, due to increases in racial minority proportions in HD 105 and 111, as described earlier in this report. This pro-Democratic shift in the two districts suggests that the use of EI-based predictions likely under-estimates the true Democratic vote share in a hypothetical November 2016 election held using the 2012 Plan's boundaries.

Hence, a more realistic method of estimating hypothetical November 2016 election outcomes involves using actual precinct-level House election outcomes from November 2016 for those precincts that were not removed from HD 105 or 111 by the 2015 Plan; for precincts that were removed, the same EI predicted results are used.

**Table 11:**  
**Combined Estimates of Hypothetical 2016 Election Results**  
**Within the Boundaries of HD 105 from the 2012 House Plan**

	<b>Estimates of November 2016 Votes for a Black Democratic Candidate within the Boundaries of HD 105 of the 2012 House Plan</b>		<b>Estimates of November 2016 Votes for a White Republican Candidate within the Boundaries of HD 105 of the 2012 House Plan</b>	
Precinct Name:	Actual Nov. 2016 Votes for Dem. Donna McLeod (in precincts where HD 105 was not altered by the 2015 Plan):	EI-based Estimate of Nov. 2016 Votes for a Black Democratic Candidate (in precincts where HD 105 was altered by the 2015 Plan):	Actual Nov. 2016 Votes for Rep. Joyce Chandler (in precincts where HD 105 was not altered by the 2015 Plan):	EI-based Estimate of Nov. 2016 Votes for a Black Democratic Candidate (in precincts where HD 105 was altered by the 2015 Plan):
60-Lawrenceville D *		1230		492
71-Lawrenceville F	1432		484	
78-Baycreek K	1018		1236	
80-Baycreek C	1999		1701	
91-Baycreek D	1137		1702	
134-Baycreek F	1495		1060	
144-Lawrenceville M *		1940		913
146-Baycreek H *	817		1665	
147-Baycreek I	1712		1449	
	<b>Combined Total Estimated Votes for a Black Democratic Candidate:</b>		<b>Combined Total Estimated Votes for a White Republican Candidate:</b>	
	12,780 (54.4%)		10,702 (45.6%)	

\* Indicates that the precinct was split into multiple districts, including House District 111. Only those voters residing within HD 111 of the 2012 Plan are included in the EI estimates and estimated vote totals reported in this Table.

**Table 12:  
Combined Estimates of Hypothetical 2016 Election Results  
Within the Boundaries of HD 111 from the 2012 House Plan**

	<b>Estimates of November 2016 Votes for a Black Democratic Candidate within the Boundaries of HD 111 of the 2012 House Plan</b>		<b>Estimates of November 2016 Votes for a White Republican Candidate within the Boundaries of HD 111 of the 2012 House Plan</b>	
Precinct Name:	Actual Nov. 2016 Votes for Dem. Darryl Payton (in precincts where HD 111 was not altered by the 2015 Plan):	EI-based Estimate of Nov. 2016 Votes for a Black Democratic Candidate (in precincts where HD 111 was altered by the 2015 Plan):	Actual Nov. 2016 Votes for Rep. Brian Strickland (in precincts where HD 111 was not altered by the 2015 Plan):	EI-based Estimate of Nov. 2016 Votes for a White Republican Candidate (in precincts where HD 111 was altered by the 2015 Plan):
29 - Lowes	2602		2283	
31 - North Hampton*		803		1096
32 - Mount Carmel		1776		937
34 - Wesley Lakes	1991		1054	
40 - Stockbridge West		1988		452
41 - Stagecoach		982		1006
48 - Unity Grove	621		2264	
50 - Pates Creek	1613		1628	
51 - Oakland	1124		1532	
57 - Dutchtown	614		1095	
61 - McDonough Central*		447		676
	<b>Combined Total Estimated Votes for a Black Democratic Candidate:</b>		<b>Combined Total Estimated Votes for a White Republican Candidate:</b>	
	14,561 (50.9%)		14,023 (49.1%)	

\* Indicates that the precinct was split into multiple districts, including House District 111. Only those voters residing within HD 111 of the 2012 Plan are included in the EI estimates and estimated vote totals reported in this Table.

Table 11 illustrates this method for HD 105. Under the 2012 Plan, HD 105 contained nine precincts, including three split precincts. Of these nine precincts, seven were unaffected by the 2015 Plan: The same portions of these seven precincts assigned to HD 105 under the 2012 Plan were again assigned to HD 105 under the 2015 Plan. The remaining two precincts were affected by the 2015 redistricting: Precinct 144 (Lawrenceville M) was completely removed from HD 105, while the borders of HD 105 were altered within Precinct 60 (Lawrenceville D). Moreover, all of Lawrenceville M and portions of Lawrenceville D were reassigned to HD 104 in the 2015 Plan. In November 2016, HD 104 featured an uncontested House race with no Democratic candidate; therefore, no meaningful election results from November 2016 are available for these two reassigned precincts.

For the seven precincts in HD 105 unaffected by the 2015 Plan, Table 11 simply counts the number of House election votes received by the Black Democratic candidate (Donna McLeod) and the White Republican candidate (Joyce Chandler) in November 2016, with no EI estimates used. For the remaining two precincts affected by the 2015 Plan – Precincts 60 and 144 – Table 11 uses the same EI-based predictions derived previously in Table 9.

Table 11 sums together these actual election results and EI-based predictions for the nine precincts within the 2012 Plan boundaries of HD 105. In total, a Black Democratic candidate is expected to receive 12,780 votes, whereas a White Republican would receive 10,702 votes in a November 2016 House election held using the 2012 Plan boundaries for HD 105. The Black Democratic candidate's predicted vote share of 54.4% accounts for the increases in African-American and other minority populations that occurred in HD 105 during 2012-2016, thus producing an even more Democratic-leaning prediction than the Table 9 estimates, which solely relied upon EI predictions about racial voting patterns from 2012 election data.

Table 12 uses this identical methodology for HD 111, yielding a similar prediction. The 2012 Plan boundaries for HD 111 contained all or split portions of 11 different precincts. Five of the precincts were affected by the 2015 Plan redistricting, while the House district assignments for the remaining six precincts were unaffected by the 2015 Plan. For the six unaffected precincts, Table 12 uses the actual election results from the November 2016 between Darryl Payton (Democrat) and Brian Strickland (Republican). For the remaining five precincts that affected by the 2015 Plan's redrawing of the HD 111, Table 12 uses the EI-based predictions

derived previously in Table 10 to estimate the number of votes that would have been cast in favor of a Black Democrat and a White Republican candidate.

In total, Table 12 predicts a Black Democratic candidate would receive 14,561 votes, whereas a White Republican would receive 14,023 votes in a November 2016 House election held using the 2012 Plan boundaries for HD 111. Once again, this prediction, by using actual November 2016 election results in precincts unaffected by the 2015 Plan redistricting, yields a somewhat higher Democratic vote share than the purely EI-based predictions in Table 10.

### **Changes Made to HD 105 and HD 111 by the 2015 Plan**

In analyzing the sequence of changes made to HD 105 and HD 111 by the 2015 Plan, I first reviewed the November 20, 2017 deposition testimony of Ms. Gina Wright, the Legislature's primary map-drawer for the 2015 Plan. In this section, I describe how the 2015 Plan made a series of changes to the boundaries of HD 105 and HD 111 that altered the racial composition of these districts by subordinating traditional districting principles, including principles set forth in the Redistricting Guidelines. I first describe the series of changes the 2015 Plan made to HD 105 and 111 and how these changes noticeably decreased the African-American population in both districts. I then describe how these racial changes to the district boundaries subordinated traditional districting principles.

***Changes to HD 105:*** As constructed by the 2012 Plan, HD 105 had a Black Voting Age Population (BVAP) of 33.1%, based on 2010 Census data. The 2015 Plan made a series of three changes to the boundaries of HD 105, and all three of these changes uniformly had the effect of decreasing the African-American population of HD 105. This sequence of changes to HD 105 was described by Ms. Wright in her deposition in this case, and I relied upon pp. 214-219 from the transcript of her deposition in analyzing her she redrew the HD 105 boundaries.

First, the 2015 Plan added two precincts to the eastern portion of HD 105, and both of these added precincts are comprised of overwhelmingly White population, thus decreasing the overall BVAP of HD 105. The two precincts added to HD 105 were Harbins C (11.2% BVAP) and a portion of Harbins A (containing a 14.5% BVAP). Because of the overwhelmingly White populations in Harbins A and Harbins C, these additions to HD 105 each served to decrease the African-American and Hispanic proportions of HD 105.



To offset the population gain caused by adding Harbins A and Harbins C, the 2015 Plan then removed more heavily African-American population from the northwestern end of district in the Lawrenceville area. Specifically, at the northwestern end of district, the 2015 Plan removed the portion of the Lawrenceville M precinct that had previously been assigned to HD 105 under the 2012 Plan. This portion of Lawrenceville contains a BVAP of 45.6%. To partially offset the population loss caused by the removal of Lawrenceville M, the 2015 Plan slightly expanded the portions of the adjacent Lawrenceville D precinct assigned to HD 105. These two alterations to HD 105 had the overall effect of decreasing the Voting Age Population by 3,713 of which 35.1% consisted of African-Americans. Hence, these two alterations combined to decrease the overall BVAP of HD 105. Altogether, combined with the Harbins A and Harbins C additions to the district, these changes decreased the BVAP of HD 105 from 33.1% under the 2012 Plan to 31.0% under the 2015 Plan.

***Changes to HD 111:*** As constructed by the 2012 Plan, HD 111 had a Black Voting Age Population (BVAP) of 33.9%, based on 2010 Census data. The 2015 Plan made a similar series of changes in HD 111, having the overall effect of decreasing the BVAP of the district by 2.2%. I relied upon pp. 183 and pp. 224-230 of the transcript of Ms. Wright's deposition in analyzing her she redrew the 111 105 boundaries.

First, the 2015 Plan removed the northernmost precincts in HD 111, which includes areas with substantial black population. Most notably, the 2015 Plan removed the Stockbridge West precinct from the northern portion of the district. Stockbridge West's BVAP of 59.8% is the highest of any precinct in District 111 in the 2012 plan. Having removed Stockbridge West, the 2015 Plan was then also forced to remove the Stagecoach precinct (28.3% BVAP) because this precinct would not have been contiguous with the rest of HD 111 if it remained in the district. Overall, then, the removal of Stockbridge West and Stagecoach constituted the removal of a northern portion of HD 111 consisting of 45.2% BVAP. In the northern portion of HD 111, the population loss created by the removal of Stockbridge West and Stagecoach were partially offset by the addition of part of the Flippen precinct. This portion of Flippen contains a BVAP of 38.7%, which is lower than the combined BVAP of the removed Stockbridge West and Stagecoach precincts. Thus, replacing Stockbridge West and Stagecoach with this portion of Flippen served to decrease the overall BVAP of HD 111.

Additionally, the 2015 Plan further removed portions of the North Hampton and Mount Carmel precincts from the western side of HD 111. The removed portions of these two precincts had a combined BVAP of 32.7%. To offset this population loss created by the removal of the northern and western precincts in HD 111, the 2015 Plan expanded the southeastern portion of HD 111 into a predominantly White portion of Henry County. Specifically, the entirety of the Grove Park precinct (21.4% BVAP) and a portion of the Tussahaw precinct (4.8% BVAP) were added to HD 111, and these additions substantially decreased the overall BVAP of HD 111.

Finally, the 2015 Plan made alterations to the HD 111 boundaries within the split precinct of McDonough Central that again had the effect of decreasing the district's overall African-American population. The redrawing of the HD 111 boundaries within the McDonough Central precinct caused a noticeable decrease in the BVAP of the portion of McDonough Central belonging to HD 111. The BVAP of the portion of the McDonough Central precinct lying within HD 111 decreased from 30.2% under the 2012 Plan to 26.9% under the 2015 Plan.

***The 2015 Plan and Traditional Districting Principles:*** In evaluating the 2015 Plan's compliance with traditional districting principles, I first examined the principles set forth in the "2011-2012 Guidelines for the House Legislative and Congressional Reapportionment Committee" (Hereinafter: "Redistricting Guidelines"). These principles include population equality, geographic compactness, and avoiding the splitting of precincts and counties. Tables 13 and 14 describe various characteristics of HD 105 and HD 111 under both the 2012 and the 2015 Plans.

First, I found that the 2015 Plan creates more significant population deviations in both HD 105 and HD 111, relative to the 2012 Plan. Georgia's total population, as of the 2010 Census, is 9,687,653, so the ideal district population for a House district is 53,820.29. HD 105's population deviation increased in magnitude from 102 under the 2012 Plan to 278 under the 2015 Plan. Similarly, HD 111's population deviation increased from 376 under the 2012 Plan to 472 under the 2015 Plan. Although these deviations are not especially large, it is nevertheless clear that the 2015 Plan had a slight deleterious effect on compliance with population equality in both districts.

**Table 13:  
Characteristics of House District 105:**

	<b>2012 Plan:</b>	<b>2015 Plan:</b>
<b>Split Precincts:</b>	Lawrenceville D Lawrenceville M Baycreek H	Harbins A Lawrenceville D Baycreek H
<b>Split Municipalities:</b>	Grayson (105,106,114) Lawrenceville (101,102,104,105,106,107) Snellville (93,105,106,107)	Grayson (105,106,114) Lawrenceville (101,102,104,105,106,107) Snellville (93,105,106,107)
<b>Reock Compactness:</b>	0.3213	0.3175
<b>Popper-Polsby Compactness:</b>	0.2354	0.2280
<b>Total Population (2010 Census):</b>	53,718	53,542
<b>Total Voting Age Population (2010 Census):</b>	36,580	36,449
<b>Any Part Black Voting Age Population (2010 Census):</b>	12,100 (33.1%)	11,313 (31.0%)
<b>November 2016 Total Turnout:</b>	24,945	26,641
<b>November 2016 African-American Turnout:</b>	9,199 (36.9%)	8,443 (32.9%)

\* Georgia's statewide population as of the 2010 Census was 9,687,653, so the ideal district population is 53,820.29.

**Table 14:  
Characteristics of House District 111:**

	<b>2012 Plan:</b>	<b>2015 Plan:</b>
<b>Split Precincts:</b>	McDonough Central North Hampton	Flippen Hickory Flat McDonough Central Mount Carmel Tussahaw
<b>Split Municipalities:</b>	Locust Grove (111,130) McDonough (109,110,111) Stockbridge (76,78,90,109,111)	Locust Grove (111,130) McDonough (109,110,111) Stockbridge (76,78,90,109,111)
<b>Reock Compactness:</b>	0.3160	0.3153
<b>Popper-Polsby Compactness:</b>	0.1317	0.1234
<b>Total Population (2010 Census):</b>	54,197	54,293
<b>Total Voting Age Population (2010 Census):</b>	38,545	38,235
<b>Any Part Black Voting Age Population (2010 Census):</b>	13,068 (33.9%)	12,103 (31.7%)
<b>November 2016 Total Turnout:</b>	29,087	28,851
<b>November 2016 African-American Turnout:</b>	11,735 (40.3%)	10,794 (37.4%)

\* Georgia's statewide population as of the 2010 Census was 9,687,653, so the ideal district population is 53,820.29.

Next, I then evaluated how the 2015 Plan affected the geographic compactness of the two districts. Once again, I found that the 2015 Plan worsened compliance with the Redistricting Guidelines in both districts. I measured the geographic compactness of the two districts under both plans using the Reock score and the Popper-Polsby score. Both of these compactness measures are commonly used by scholars of redistricting, and with measures, higher scores indicating greater compactness, while lower scores indicate more non-compact districts.

First, I calculated the average Reock score of both districts under both plans. The Reock score for each individual district is calculated as the ratio of the district's area to the area of the smallest bounding circle that can be drawn to completely contain the district. HD 105's Reock score slightly worsened from 0.3213 under the 2012 Plan to 0.3175 under the 2015 Plan. Similarly, HD 111's Reock score slightly worsened from 0.3160 under the 2012 Plan to 0.3153 under the 2015 Plan.

Second, I calculate the average Popper-Polsby score of both districts under both plans. The Popper-Polsby score for each individual district is calculated as the ratio of the district's area to the area of a hypothetical circle whose circumference is identical to the length of the district's perimeter. HD 105's Popper-Polsby score slightly worsened from 0.2354 under the 2012 Plan to 0.2280 under the 2015 Plan. Similarly, HD 111's Popper-Polsby score slightly worsened from 0.1317 under the 2012 Plan to 0.1234 under the 2015 Plan. Hence, it is clear that using either the Reock or the Popper-Polsby measure, the 2015 Plan had a slight deleterious effect on the geographic compactness of both districts.

Next, I evaluated how well the two plans avoided splitting precincts in HD 105 and HD 111. I found that HD 105 split two precincts (Lawrenceville D, and Lawrenceville M) under the 2012 Plan and two precincts (Harbins A, and Lawrenceville D) under the 2015 Plan. Thus, the 2015 Plan neither increased nor decreased the total number of precincts split by HD 105.

In HD 111, however, the 2015 substantially increased the number of split precincts from two to five. Under the 2012 Plan, HD 111 split only two precincts (North Hampton and McDonough Central). The 2015 Plan removed North Hampton from HD 111, also added partial fragments of three new precincts (Tussahaw, Hickory Flat, and Flippen), while removing a portion of Mount Carmel from the district. These numerous changes resulted in HD 111 splitting five precincts (McDonough Central, Mount Carmel, Tussahaw, Hickory Flat, and Flippen) under

the 2015 Plan. Hence, the 2015 Plan severely worsened HD 111 with respect to the traditional districting criterion of avoiding precinct splits.

I further evaluated how well the two plans followed county boundaries in the areas surrounding HD 105 and HD 111. Overall, I found that the 2015 Plan significantly deviates from the Redistricting Guidelines' principle of avoiding county splits in both Gwinnett County and in Henry County. In general, it is relatively straightforward to draw a legislative plan with equally populated, contiguous districts while having, at most, one district in each county that crosses the county's borders. In both Gwinnett and Henry Counties, the 2015 Plan has far more districts crossing county borders than is necessary.

In Gwinnett County, there are six districts – HD 81, 93, 94, 95, 103, and 114 – that cross the borders of Gwinnett County. That is, each of these six districts partially lies within Gwinnett and partially lies within another adjacent county. Similarly, Henry County has seven districts – HD 73, 76, 78, 90, 109, 110, and 130 – that cross the borders of Henry County. Each of these seven districts partially lies within Henry County and partially lies within another adjacent county. Overall, such a large number of cross-county districts involving Gwinnett and Henry Counties indicates a failure of the 2015 Plan to follow county boundaries in the drawing of the House districts in these two counties.

A further measure of any districting plan's adherence to county boundaries is the number of districts that lie fully within any given county's boundaries. Gwinnett County has a 2010 Census population of 842,046, so with an ideal House district population of 53,830, Gwinnett can geographically accommodate up to 15 full House districts within its borders. However, under the 2015 plan, Gwinnett County contains only 12 House districts lying fully within its borders. The remaining six districts in Gwinnett County – HD 81, 93, 94, 95, 103, and 114 – spill over into adjacent counties. Hence, it is clear that the 2015 Plan created districts in Gwinnett County that generally failed to respect county boundaries.

Yet more striking is the failure of the 2015 Plan to draw districts respecting the boundaries of Henry County. Henry County has a 2010 Census population of 209,053, so with an ideal House district population of 53,830, Henry County can geographically accommodate up to 3 full House districts within its borders. However, the 2015 Plan creates only one district (HD 111) that lies completely within the boundaries of Henry County. The remaining seven districts in Henry County – HD 73, 76, 78, 90, 109, 110, and 130 – spill over into adjacent counties.

Hence, it is clear that the 2015 Plan created districts in Henry County that generally failed to respect county boundaries.

Finally, although the avoiding of municipal splits is not specifically mentioned in the Redistricting Guidelines, I analyzed HD 105 and HD 111 with respect to its adherence to municipal boundaries because avoiding municipal splits is a traditional districting principle. Specifically, I found that the 2015 Plan splits up municipalities within HD 105 and HD 111 into significantly more fragmented pieces than was necessary.

HD 105 contains three municipalities that are split up into several districts by the 2015 Plan. Most notably the city of Lawrenceville contains a population of 28,546, so can be fully contained within a single House district. Yet, the 2015 Plan splits of Lawrenceville into portions of seven different House districts (HD 101, 102, 104, 105, 106, 107). This fragmentation of the city of Lawrenceville is especially noteworthy because of the city's significant African-American and Hispanic population (32.0% African-American and 22.3% Hispanic population). As described earlier in this section, the 2015 Plan altered the boundaries of HD 105 in Lawrenceville's precincts in ways that decreased the BVAP of the district's population in the Lawrenceville area.

Similarly, the 2015 Plan splits the city of Grayson into three different House districts, while the city of Snellville is split into four different House districts. Given the small populations of both cities (2,666 for Grayson and 18,242 for Snellville), each of these two cities could have been fully accommodated within a single House district. Overall, then, the 2015 Plan's splitting of Lawrenceville, Grayson, and Snellville into several districts indicates a significant failure to respect municipal boundaries in the drawing of HD 105.

In HD 111, the 2015 Plan split three different municipalities: Locust Grove, McDonough, and Stockbridge. Most notably, the 2015 Plan splits the city of McDonough into three different districts (HD 109, 110, and 111), even though McDonough's population of 22,084 could easily have been accommodated within a single House district. This decision to split McDonough, a majority-African-American city, is notable: As described earlier in this section, the 2015 Plan altered the boundaries of HD 111 in McDonough's precincts in ways that incorporated less-heavily African-American portions of McDonough into HD 111 while excluding some more heavily African-American portions of McDonough from HD 111.

Equally notable is the precise way in which the 2015 Plan split the city of Stockbridge, which also has a majority African-American population, into five districts (HD 76, 78, 90, 109, 111). Stockbridge's 2010 Census population of 25,636 could easily have been accommodated within a single House district. But the 2015 Plan's decision to split up Stockbridge into five separate districts had important racial consequences: As described earlier in this section, the 2015 Plan removed one of Stockbridge's precincts containing a majority African-American population (the Stockbridge West precinct) while redrawing HD 111's boundaries in the northern portion of the district in a manner that excluded much of the Stockbridge's African-American population from HD 111. Yet the 2015 Plan did not simply re-assign the majority-African-American population of Stockbridge into another adjacent district. Rather, the heavily African-American population of Stockbridge was scattered into portions of four other districts (HD 76, 78, 90, 109) by the 2015 Plan, thus minimizing the influence that Stockbridge voters would have within any single House district.

Overall, I find that the 2015 Plan redrew the boundaries of HD 105 and HD 111 through a series of changes that consistently decreased the African-American proportion of both districts. Moreover, I find that the redrawing of the two districts' boundaries along these racial lines came at the sacrifice of adherence to traditional districting principles: The new 2015 Plan worsened the population equality and geographic compactness of HD 105 and HD 111. The 2015 Plan also significantly increased the number of split precincts in HD 111 from two to five. Moreover, districts around the areas of HD 105 and HD 111 split up municipalities and ignored county boundaries far more than necessary.

### **Analysis of Racial Breakdowns of Split Precincts**

This section discusses my evaluation of the racial composition of split precincts in HD 105 and 111, as drawn by the 2015 Plan. When evaluating precincts split by House districts in Georgia, it is important to recognize what sub-precinct-level data is available and unavailable to the Legislature's map-drawer when drawing any districting plan. In Georgia, all partisan data, including election results, are available only at the precinct level. Election returns are not reported by the Secretary of State at the sub-precinct level, nor does the Secretary of State provide any estimated sub-precinct level election returns. In other words, it is impossible for a



map-drawer to gain detailed knowledge of whether one split portion of a precinct is more heavily Democratic or Republican-leaning than another split portion of the same precinct.

On the other hand, racial data is indeed available at the sub-precinct level from two sources: In Georgia, residents are asked to select their racial identification when they register to vote. Therefore, publicly available voter registration lists in Georgia contain information on the racial identification of each individual voter, along with the voter's residential address. Hence, it is indeed possible to calculate how the racial composition of one split portion of a precincts differs from another split portion of the same precinct. Furthermore, census block-level racial data, as provided by the US Census Bureau in Redistricting Data Summary File 1, enables map-drawers to easily calculate the 2010 Census racial composition of any split precinct in Georgia.

In evaluating the racial composition of split precincts in the 2015 Plan, I first reviewed the November 20, 2017 deposition testimony of Ms. Gina Wright, the Legislature's primary map-drawer for the Act 251 of 2015 State House Plan. Ms. Wright testified that 1) The Legislative and Congressional Reapportionment Office obtained precinct-level political data, including election results and registration counts, from the Georgia Secretary of State; 2) The Reapportionment Office analyzed no partisan data at any lower level of geography than the precinct level; and 3) The Reapportionment Office simply assumed that all census blocks (and other sub-precinct geographies) within any individual precinct had the same percentage of Democrats and Republicans with respect to any available partisan measure (pp. 111-113).

Based on Ms. Wright's deposition testimony, as well as my own experience and expertise using redistricting and Census data, it is thus apparent that partisan considerations cannot explain the particular ways in which the Reapportionment Office drew boundaries *within* the precincts that were split by HD 105 and HD 111 of the 2015 Plan. Therefore, having eliminated partisan considerations as an explanation for the particular ways in which precincts were split, I evaluated whether the particular ways in which the HD 105 and HD 111 split precincts followed any apparent racial patterns.

In the 2015 Plan, HD 105 splits three precincts, while HD 111 splits five precincts. In other words, there are three precincts partially assigned to HD 105 and partially assigned to another neighboring district, and there are five precincts partially assigned to HD 111 and partially assigned to another district. Hence, there are eight total split precincts. Among these eight split precincts, I found a striking racial pattern in the way particular ways these precincts

were split: Six of the eight precincts were split such that the respective portions of the precincts assigned to HD 105 or HD 111 had a lower African-American share of the Voting Age Population (VAP), while the portions of the precincts *not* assigned to HD 105 or HD 111 had a higher African-American proportion. Given that the Reapportionment Office did not analyze partisan data at the sub-precinct level, this striking racial pattern suggests that racial considerations explain the particular ways in which these precincts were split.

For each of the eight split precincts created by HD 105 and HD 111, I analyzed the Any Part African-American (including multi-racial African-Americans) share of the Total Voting Age Population (hereinafter: BVAP). These BVAP calculations were produced using census block-level racial breakdowns reported in the 2010 US Census Redistricting Data Summary File 1. I overlaid a 2010 Census block shapefile onto a shapefile of the 2015 Plan districts and a shapefile of Georgia's 2,756 precincts (as of 2014), and I calculated the population within each split fragment within the eight split precincts. My findings regarding the racial breakdowns of each split precinct, as detailed in Tables 15 and 16, are as follows:

***Split Precincts Involving HD 105:*** The boundaries of HD 105 in the 2015 Plan produce three split precincts. These three split precincts, along with the 2010 Census racial breakdown of the split fragments comprising each precinct, are listed in Table 15.

Precinct 001 ("Harbins A") is split between HD 104 and HD 105. The portion of Harbins A contained within HD 105 has a 14.5% BVAP. By contrast, the portion of Harbins A assigned to HD 104 has a 33.2% BVAP.

Precinct 60 ("Lawrenceville D") is split between HD 104 and HD 105. The portion of Lawrenceville D contained within HD 105 has a 45.6% BVAP, while the portion of the precinct assigned to HD 104 has a 30.4% BVAP.

Precinct 146 ("Baycreek H") is split between HD 105 and HD 114. The portion of Baycreek H contained within HD 105 has a 13.5% BVAP, while the portion of the precinct assigned to HD 114 has a 25.3% BVAP.

Overall, two out of the three precincts split by HD 105 (Harbins A and Baycreek H) were split in such a manner that the portion of the precinct within HD 105 has a lower BVAP than the portion of the precinct outside of HD 105.

**Table 15:  
Voter Turnout by Race Within and Outside of HD 105 of the 2015 Plan In Split Precincts**

Pct:	Precinct Name:	2016 Election Turnout Within HD 105 Boundaries (2015 Plan)			2016 Election Turnout Outside of HD 105 Boundaries (2015 Plan)		
		Black	Non-Black	Black Proportion	Black	Non-Black	Black Proportion
001	Harbins A	329	1651	16.6%	602	1139	34.6%
060	Lawrenceville D	1088	933	53.8%	167	224	42.7%
146	Baycreek H	468	2096	18.3%	309	684	31.1%
	Totals by Race:			28.7%			34.5%

\* Includes only precincts that are split into multiple districts.

**2010 Census VAP by Race Within and Outside of HD 105 of the 2015 Plan  
In Split Precincts**

Pct:	Precinct Name:	2016 Election Turnout Within HD 105 Boundaries (2015 Plan)			2016 Election Turnout Outside of HD 105 Boundaries (2015 Plan)		
		Black	Total VAP	Black Proportion	Black	Total VAP	Black Proportion
001	Harbins A	313	2161	14.5%	845	2542	33.2%
060	Lawrenceville D	2428	5320	45.6%	405	1334	30.4%
146	Baycreek H	419	3112	13.5%	343	1357	25.3%
	Totals by Race:	3160	10592	29.8%	1,593	5,233	30.4%

\* Includes only precincts that are split into multiple districts. Source: 2010 US Census Redistricting Data Summary File 1.

Moreover, none of these three precincts are split in a manner that was necessitated by the principles set forth in the “2011-2012 Guidelines for the House Legislative and Congressional Reapportionment Committee” (Hereinafter: “Redistricting Guidelines”). First, the Redistricting Guidelines call for plans to preserve existing precinct boundaries. HD 105’s splitting of three precincts is more than was necessary to achieve population equality in the district. Second, none of these three precincts included non-contiguous fragments, so the splitting of these precincts was not necessary for preserving the geographic contiguity of HD 105 or any neighboring district. Third, the decision to split each of these three precincts, rather than assign the entire precinct to HD 105 or to another district, decreased the geographic compactness of the entire district, as measured by Reock score. Finally, none of these three precincts crosses a county boundary; thus, the splitting of these three precincts was not necessary for the preservation of county boundaries.

In sum, the splitting of three precincts in HD 105 appears to have followed the racial consideration of excluding more heavily-African-American portions of these precincts from HD 105 while including less heavily-African-American portions in HD 105. This racial consideration in splitting the precincts also required the subordination of the Redistricting Guidelines, particularly the preservation of precinct boundaries.

***Split Precincts Involving HD 111:*** The boundaries of HD 111 in the 2015 Plan produce five split precincts. These five split precincts, along with the racial breakdown of the split fragments comprising each precinct, are listed in Table 16.

Precinct 26 (“Tussahaw”) is split between HD 110 and HD 111. The portion of Tussahaw contained within HD 111 has a 4.8% BVAP, while the portion of the precinct assigned to HD 110 has a 6.9% BVAP.

Precinct 32 (“Mount Carmel”) is split between HD 073 and HD 111. The portion of Mount Carmel contained within HD 111 has a 43.7% BVAP, while the portion of the precinct assigned to HD 104 has a 45.2% BVAP.

Precinct 38 (“Hickory Flat”) is split between HD 109 and HD 111. The portion of Hickory Flat contained within HD 111 has a 50.6% BVAP, while the portion of the precinct assigned to HD 109 has a 33.6% BVAP.

**Table 16:  
Voter Turnout by Race Within and Outside of HD 111 of the 2015 Plan  
In Each Split Precinct**

Precinct Name:	2016 Election Turnout Within HD 111 Boundaries (2015 Plan)			2016 Election Turnout Outside of HD 111 Boundaries (2015 Plan)		
	Black	Non-Black	Black Proportion	Black	Non-Black	Black Proportion
26 - Tussahaw	25*	498*	4.8%	98	1554	5.9%
32 - Mount Carmel	1023*	803*	56.0%	494	393	55.7%
38 - Hickory Flat	795*	583*	57.7%	699	1173	37.3%
53 - Flippen	884*	1106*	44.4%	379	452	45.6%
61 - McDonough Central	302*	759*	28.5%	649	765	45.9%
Totals by Race:	3029	3749	44.7%	2319	4337	34.8%

\* Includes only precincts that are split into multiple districts.

**2010 Census VAP by Race Within and Outside of HD 111 of the 2015 Plan  
In Each Split Precinct**

Precinct Name:	2016 Election Turnout Within HD 111 Boundaries (2015 Plan)			2016 Election Turnout Outside of HD 111 Boundaries (2015 Plan)		
	Black	Total VAP	Black Proportion	Black	Total VAP	Black Proportion
26 - Tussahaw	38	789	4.8%	171	2461	6.9%
32 - Mount Carmel	699	1601	43.7%	381	842	45.2%
38 - Hickory Flat	995	1967	50.6%	785	2338	33.6%
53 - Flippen	961	2478	38.8%	520	1264	41.1%
61 - McDonough Central	404	1504	26.9%	950	1895	50.1%
Totals by Race:	3097	8339	37.1%	2807	8800	31.9%

\* Includes only precincts that are split into multiple districts. Source: 2010 US Census Redistricting Data Summary File 1

Precinct 53 (“Flippen”) is split between HD 109 and HD 111. The portion of Flippen contained within HD 111 has a 38.8% BVAP, while the portion of the precinct assigned to HD 109 has a 41.1% BVAP.

Precinct 61 (“McDonough Central”) is split between HD 109 and HD 111. The portion of McDonough Central contained within HD 111 has a 26.9% BVAP, while the portion of the precinct assigned to HD 109 has a 50.1% BVAP.

Overall, four out of the five precincts split by HD 111 (Tussahaw, Mount Carmel, Flippen, and McDonough Central) were split in such a manner that the portion of the precinct within HD 111 has a lower BVAP than the portion of the precinct outside of HD 111.

Moreover, none of these five precincts are split in a manner that was necessitated by the principles set forth in the Redistricting Guidelines. First, HD 111’s splitting of five precincts is more than was necessary to achieve population equality in the district. Second, none of these five precincts included non-contiguous fragments, so the splitting of these precincts was not necessary for preserving the geographic contiguity of HD 111 or any neighboring district. Third, the decision to split each of these five precincts, rather than assign the entire precinct to HD 111 or to another neighboring district, decreased the geographic compactness of the entire district, as measured by Reock score. Finally, none of these five precincts crosses a county boundary; thus, the splitting of these five precincts was not necessary for the preservation of county boundaries.

In sum, the splitting of five precincts in HD 111 appears to have followed the racial consideration of excluding more heavily-African-American portions of these precincts from HD five while including less heavily-African-American portions in HD five. This racial consideration in splitting the precincts also required the subordination of the Redistricting Guidelines, particularly the preservation of precinct boundaries.

I declare under penalty of perjury the foregoing is true and correct. Executed this 22nd day of December 2017.

Signed:

A handwritten signature in black ink, appearing to read "Jowei Chen", written over a horizontal line.

Jowei Chen

**Jowei Chen**  
**Curriculum Vitae**

Department of Political Science  
University of Michigan  
5700 Haven Hall  
505 South State Street  
Ann Arbor, MI 48109-1045  
Phone: 917-861-7712, Email: [jowei@umich.edu](mailto:jowei@umich.edu)  
Website: <http://www.umich.edu/~jowei>

**Academic Positions:**

Associate Professor (2015-present), Assistant Professor (2009-2015), Department of Political Science, University of Michigan.  
Faculty Associate, Center for Political Studies, University of Michigan, 2009 – Present.  
W. Glenn Campbell and Rita Ricardo-Campbell National Fellow, Hoover Institution, Stanford University, 2013.  
Principal Investigator and Senior Research Fellow, Center for Governance and Public Policy Research, Willamette University, 2013 – Present.

**Education:**

Ph.D., Political Science, Stanford University (June 2009)  
M.S., Statistics, Stanford University (January 2007)  
B.A., Ethics, Politics, and Economics, Yale University (May 2004)

**Publications:**

Chen, Jowei and Neil Malhotra. 2007. "The Law of k/n: The Effect of Chamber Size on Government Spending in Bicameral Legislatures."

[\*American Political Science Review\*, 101\(4\): 657-676.](#)

Chen, Jowei, 2010. "The Effect of Electoral Geography on Pork Barreling in Bicameral Legislatures."

[\*American Journal of Political Science\*, 54\(2\): 301-322.](#)

Chen, Jowei, 2013. "Voter Partisanship and the Effect of Distributive Spending on Political Participation."

[\*American Journal of Political Science\*, 57\(1\): 200-217.](#)

Chen, Jowei and Jonathan Rodden, 2013. "Unintentional Gerrymandering: Political Geography and Electoral Bias in Legislatures"

[\*Quarterly Journal of Political Science\*, 8\(3\): 239-269.](#)

Chen, Jowei, 2014. "Split Delegation Bias: The Geographic Targeting of Pork Barrel Earmarks in Bicameral Legislatures."

[\*Revise and Resubmit, State Politics and Policy Quarterly\*.](#)



Bradley, Katharine and Jowei Chen, 2014. "Participation Without Representation? Senior Opinion, Legislative Behavior, and Federal Health Reform."

[Journal of Health Politics, Policy and Law. 39\(2\), 263-293.](#)

Chen, Jowei and Tim Johnson, 2015. "Federal Employee Unionization and Presidential Control of the Bureaucracy: Estimating and Explaining Ideological Change in Executive Agencies."

[Journal of Theoretical Politics, Volume 27, No. 1: 151-174.](#)

Bonica, Adam, Jowei Chen, and Tim Johnson, 2015. "Senate Gate-Keeping, Presidential Staffing of 'Inferior Offices' and the Ideological Composition of Appointments to the Public Bureaucracy."

[Quarterly Journal of Political Science. Volume 10, No. 1: 5-40.](#)

Chen, Jowei and Jonathan Rodden, 2015. "Cutting through the Thicket: Redistricting Simulations and the Detection of Partisan Gerrymanders."

[Election Law Journal. Volume 14, Number 4: 331-345.](#)

Chen, Jowei and David Cottrell, 2016. "Evaluating Partisan Gains from Congressional Gerrymandering: Using Computer Simulations to Estimate the Effect of Gerrymandering in the U.S. House."

[Electoral Studies. Volume 44 \(December 2016\): 329-340.](#)

Chen, Jowei, 2016. "Analysis of Computer-Simulated Districting Maps for the Wisconsin State Assembly."

[Forthcoming 2017, Election Law Journal.](#)

### **Research Grants:**

Principal Investigator. [National Science Foundation Grant SES-1459459](#), September 2015 – August 2017 (\$165,008). "The Political Control of U.S. Federal Agencies and Bureaucratic Political Behavior."

"Economic Disparity and Federal Investments in Detroit," (with Brian Min) 2011. Graham Institute, University of Michigan (\$30,000).

"The Partisan Effect of OSHA Enforcement on Workplace Injuries," (with Connor Raso) 2009. John M. Olin Law and Economics Research Grant (\$4,410).

### **Invited Talks:**

September, 2011. University of Virginia, American Politics Workshop.

October 2011. Massachusetts Institute of Technology, American Politics Conference.

January 2012. University of Chicago, Political Economy/American Politics Seminar.

February 2012. Harvard University, Positive Political Economy Seminar.

September 2012. Emory University, Political Institutions and Methodology Colloquium.  
November 2012. University of Wisconsin, Madison, American Politics Workshop.  
September 2013. Stanford University, Graduate School of Business, Political Economy Workshop.  
February 2014. Princeton University, Center for the Study of Democratic Politics Workshop.  
November 2014. Yale University, American Politics and Public Policy Workshop.  
December 2014. American Constitution Society for Law & Policy Conference: Building the Evidence to Win Voting Rights Cases.  
February 2015. University of Rochester, American Politics Working Group.  
March 2015. Harvard University, Voting Rights Act Workshop.  
May 2015. Harvard University, Conference on Political Geography.  
October 2015. George Washington University School of Law, Conference on Redistricting Reform.  
September 2016. Harvard University Center for Governmental and International Studies, Voting Rights Institute.  
March 2017. Duke University, Redistricting Reform: Mapping our Future Conference.  
October 2017. Willamette University College of Law.  
October 2017. University of Wisconsin, Metric Geometry and Gerrymandering Group.

#### **Conference Service:**

Section Chair, 2017 APSA (Chicago, IL), Political Methodology Section  
Discussant, 2014 Political Methodology Conference (University of Georgia)  
Section Chair, 2012 MPSA (Chicago, IL), Political Geography Section.  
Discussant, 2011 MPSA (Chicago, IL) "Presidential-Congressional Interaction."  
Discussant, 2008 APSA (Boston, MA) "Congressional Appropriations."  
Chair and Discussant, 2008 MPSA (Chicago, IL) "Distributive Politics: Parties and Pork."

#### **Conference Presentations and Working Papers:**

"Ideological Representation of Geographic Constituencies in the U.S. Bureaucracy," (with Tim Johnson). 2017 APSA.

"Incentives for Political versus Technical Expertise in the Public Bureaucracy," (with Tim Johnson). 2016 APSA.

"Black Electoral Geography and Congressional Districting: The Effect of Racial Redistricting on Partisan Gerrymandering". 2016 Annual Meeting of the Society for Political Methodology (Rice University)

"Racial Gerrymandering and Electoral Geography." Working Paper, 2016.

"Does Deserved Spending Win More Votes? Evidence from Individual-Level Disaster Assistance," (with Andrew Healy). 2014 APSA.

“The Geographic Link Between Votes and Seats: How the Geographic Distribution of Partisans Determines the Electoral Responsiveness and Bias of Legislative Elections,” (with David Cottrell). 2014 APSA.

“Gerrymandering for Money: Drawing districts with respect to donors rather than voters.” 2014 MPSA.

“Constituent Age and Legislator Responsiveness: The Effect of Constituent Opinion on the Vote for Federal Health Reform.” (with Katharine Bradley) 2012 MPSA.

“Voter Partisanship and the Mobilizing Effect of Presidential Advertising.” (with Kyle Dropp) 2012 MPSA.

“Recency Bias in Retrospective Voting: The Effect of Distributive Benefits on Voting Behavior.” (with Andrew Feher) 2012 MPSA.

“Estimating the Political Ideologies of Appointed Public Bureaucrats,” (with Adam Bonica and Tim Johnson) 2012 Annual Meeting of the Society for Political Methodology (University of North Carolina)

“Tobler’s Law, Urbanization, and Electoral Bias in Florida.” (with Jonathan Rodden) 2010 Annual Meeting of the Society for Political Methodology (University of Iowa)

“Unionization and Presidential Control of the Bureaucracy” (with Tim Johnson) 2011 MPSA.

“Estimating Bureaucratic Ideal Points with Federal Campaign Contributions” 2010 APSA. (Washington, DC).

“The Effect of Electoral Geography on Pork Spending in Bicameral Legislatures,” Vanderbilt University Conference on Bicameralism, 2009.

"When Do Government Benefits Influence Voters' Behavior? The Effect of FEMA Disaster Awards on US Presidential Votes," 2009 APSA (Toronto, Canada).

"Are Poor Voters Easier to Buy Off?" 2009 APSA (Toronto, Canada).

"Credit Sharing Among Legislators: Electoral Geography's Effect on Pork Barreling in Legislatures," 2008 APSA (Boston, MA).

“Buying Votes with Public Funds in the US Presidential Election,” Poster Presentation at the 2008 Annual Meeting of the Society for Political Methodology (University of Michigan).

“The Effect of Electoral Geography on Pork Spending in Bicameral Legislatures,” 2008 MPSA.

“Legislative Free-Riding and Spending on Pure Public Goods,” 2007 MPSA (Chicago, IL).

“Free Riding in Multi-Member Legislatures,” (with Neil Malhotra) 2007 MPSA (Chicago, IL).

“The Effect of Legislature Size, Bicameralism, and Geography on Government Spending: Evidence from the American States,” (with Neil Malhotra) 2006 APSA (Philadelphia, PA).

**Reviewer Service:**

American Journal of Political Science  
American Political Science Review  
Journal of Politics  
Quarterly Journal of Political Science  
American Politics Research  
Legislative Studies Quarterly  
State Politics and Policy Quarterly  
Journal of Public Policy  
Journal of Empirical Legal Studies  
Political Behavior  
Political Research Quarterly  
Political Analysis  
Public Choice  
Applied Geography