In The Matter Of:

William Whitford, et al., vs.
Gerald Nichol, et al.

Deposition of KENNETH R. MAYER, Ph.D.
March 30, 2016

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Gerald Nichol, et al.

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1   DEPOSITION of KENNETH R. MAYER, PhD, a

2   witness of lawful age, taken on behalf of the

3   Defendants, wherein William Whitford, et al., are

4   Plaintiffs, and Gerald Nichol, et al., are

5   Defendants, pending in the United States District

6   Court for the Western District of Wisconsin, pursuant

7   to notice and subpoena, before Taunia Northouse, a

8   Registered Diplomate Reporter and Notary Public in

9   and for the State of Wisconsin, at the offices of the

10   State of Wisconsin Department of Justice,

11   17 West Main Street, in the City of Madison, County

12   of Dane, and State of Wisconsin, on the 30th day of

13   March 2016, commencing at 9:03 in the forenoon.

14

15   A P P E A R A N C E S

16   BRIAN P. KEENAN and GABE JOHNSON-KARP, Assistant
     Attorneys General
17   STATE OF WISCONSIN DEPARTMENT OF JUSTICE
        17 West Main Street, Madison, Wisconsin, appearing
18   on behalf of the Defendants.
            keenanbp@doj.state.wi.us   608-266-0020
19   johnsonkarpg@doj.state.wi.us 608-267-8904

20   PAUL STRAUSS and J. CUNYON GORDON, Attorneys
     CHICAGO LAWYERS' COMMITTEE FOR CIVIL RIGHTS UNDER
21   LAW, INC.
        100 North LaSalle Street, Chicago, Illinois 60602,
22   appearing on behalf of the Plaintiffs.
            pstrauss@clccrul.org   312-202-3649
23   cgordon@clccrul.org

24

25

IN THE DISTRICT COURT OF THE UNITED STATES
FOR THE WESTERN DISTRICT OF WISCONSIN

= =

WILLIAM WHITFORD, ET AL.,

          Plaintiffs,

   -vs-   Case No. 15-cv-421-bbc

GERALD NICHOL, ET AL.,

          Defendants.

= =

Deposition of:

KENNETH R. MAYER, PhD

Madison, Wisconsin
March 30, 2016

Reported by: Taunia Northouse, RDR, CRR, CCP

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7

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23
     (Original transcript filed with Attorney Keenan,
24   copies provided to Attorneys Keenan, Strauss and
      Greenwood)
25

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1   (Appearances continued)

2

   RUTH GREENWOOD and ANNABELLE HARLESS, Attorneys
3 CAMPAIGN LEGAL CENTER
      73 West Monroe, Suite 322, Chicago, Illinois 60603,
4   appearing on behalf of the Plaintiffs.
          rgreenwood@campaignlegalcenter.org 202-560-0590
5   aharless@campaignlegalcenter.org

6 =

7   KENNETH R. MAYER, PhD,

8   called as a witness, being first duly sworn,

9   testified on oath as follows:

10   (Exhibit No. 64 marked for

11   identification)

12

13   EXAMINATION

14 By Mr. Keenan:

15 Q   Good morning, Mr. Mayer.

16 A   Good morning.

17 Q   You've been here before, so I'll be a little short

18   on the intro, but you understand you're under oath

19   today?

20 A   I do.

21 Q   And you understand you're swearing that all your

22   answers are true and correct to the best of your

23   abilities?

24 A   I do.

25 Q   Is there any reason you couldn't give truthful

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1   testimony today?

2 A   No.

3 Q   I think the -- one reminder would be that if you

4   don't understand a question I'm asking, I'll ask

5   you to let me know so that I can repeat it or

6   rephrase it and then we can get a clear record.

7   Do you understand?

8 A   I understand.

9 Q   And you're doing a good job of making verbal

10   answers, so we'll just try to continue that. And

11   then also try to let me finish my question. I'll

12   try to let you finish your answer.

13   What did you do to prepare for your

14   deposition today?

15 A I reviewed my report. I reviewed the expert

16   reports of Goedert and Trende, reviewed the

17   materials that underwent -- that went into my

18   report, reviewed some other materials and

19   depositions. That's what I did.

20 Q   Did you meet with anyone to prepare?

21 A I did.

22 Q   Who did you meet with?

23 A I met with counsel.

24 Q   And when was that?

25 A Yesterday and last Wednesday.

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1 Q   And how long were those meetings?

2 A One was about an hour and a half, and one was

3   about three hours.

4 Q   And just specifically which counsel was there?

5 A It was --

6 Q   If it differs between the two meetings --

7 A It was the people here today. Yesterday

8   Doug Poland was present, and last week

9   Nick Stephanopolous was there.

10 Q Okay. And then prior to the deposition, you were

11   aware that you had to -- you were subpoenaed for

12   some documents related to your report; is that

13   correct?

14 A That's correct.

15 Q And what did you do to gather the documents and

16   provide them to your counsel?

17 A I searched on my computer locations where I kept

18   the files, went through my report, table by table

19   and footnote by footnote, and correlated the two.

20   So any data or any information that I used to form

21   my opinion I disclosed.

22 Q   So let's get into your report. We've marked

23   Exhibit 64, and I've put a copy before you -- and

24   for the record I've also -- there's also a copy of

25   your initial report in this case here for

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1   reference in case you want to refer to it that I

2   think was marked as Exhibit 1, although the one I

3   put here doesn't actually have the exhibit sticker

4   because I didn't have a color version. So we can

5   just start on your report, and I was going to skip

6   over the summary because you get into more detail

7   later in the report, and start with Roman

8   numeral II which is on page 3.

9   I was going to direct your attention to the

10   second paragraph that starts, "I begin by noting."

11   And direct your attention to the sentence that

12   says, "Similarly, under the test third prong, if

13   the state would have to show that its plan's large

14   efficiency gap was necessitated by the geographic

15   distribution of the state's voters, then the plan

16   would be upheld."

17   What is your understanding of what that

18   means, "the state would have to show"?

19 A My understanding of the test is that it has three

20   parts. The first is intent. The second is

21   effect. And the third is whether it was possible

22   to draw an unbiased map.

23   Again, I'm not a lawyer, and this is my

24   understanding as a social scientist looking at

25   this.

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1 Q And in your understanding, is your demonstration

2   plan what you term an unbiased map?

3 A I just want to be clear about my terminology. I

4   would describe the demonstration plan as a map

5   that treats members of the political parties

6   similarly.

7 Q Is it your understanding that your demonstration

8   plan shows that the large efficiency gap in the

9   actual plan is not necessitated by the geographic

10   distribution of the state's voters?

11 A That's correct.

12 Q Now, your demonstration plan does show a

13   pro-Republican efficiency gap both in the baseline

14   model and in the incumbent model; correct?

15 A That's correct.

16 Q Is it your position that that's unbiased because

17   it's just the magnitude of the efficiency gap?

18 A To be clear, I did not draw the demonstration plan

19   with the goal of driving the efficiency gap to

20   zero, which I suspect I would have been able to

21   do, but it was to treat members of the political

22   party fairly. And I regarded an efficiency gap

23   of -- I think it was 2.2 percent as acceptable.

24 Q And --

25 A Or actually, let me clarify. As an indication

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1   that the large efficiency gap in Act 43 was not
2   necessary; that it was possible to draw a map that
3   comported with population equality, the
4   constitutional and statutory requirements, and the
5   traditional redistricting principles.
6   Q   And you mentioned the 2.2 percent gap, and that's
7   the gap under the no incumbent, all season tested
8   **baseline; correct?**
9   A   Correct.
10 Q   And while drawing the demonstration plan, did you
11   consider the residences of incumbents and where
12   they would be districted under the demonstration
13   **plan?**
14 A   I did not.
15 Q   And that would go to both Assembly members and
16   **State Senate members as well?**
17 A   That's correct.
18 Q   **Now, in this report, you've added some**
19   **calculations based on incumbency; correct?**
20 A   That's correct.
21 Q   And so those numbers have been calculated based on
22   **an after-the-fact realization of whether an**
23   incumbent was living in a particular demonstration
24   **plan district?**
25 A   That's correct.

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1   Q   **And moving to the next paragraph, you say that --**
2   **the second sentence says, "First, the geographic**
3   **concentration argument is predicated on the**
4   **foundational assumption that a neutrally drawn map**
5   **would have produced a pro-Republican bias."**
6   **Do you have an opinion on what the efficiency**
7   **gap would have been in a neutrally drawn map for**
8   **the 2012 elections?**
9   A   That's a hypothetical that I did not consider;
10   although I know that, for example, Professor Chen
11   did an analysis where he did do a number of
12   simulated maps under the neutral principles and
13   found that the efficiency gap in those plans was
14   much smaller than the one in Act 43, which I take
15   as evidence that a neutrally drawn map would tend
16   to produce a much lower efficiency gap.
17 Q   **A lower efficiency gap than the one seen in**
18   **Act 43?**
19 A   Yes.
20 Q   **But do you have an opinion on whether it would**
21   **still be a pro-Republican efficiency gap?**
22 A   Well, again using his analysis, there was a
23   small -- a small efficiency gap, but again the
24   issue is not whether the efficiency gap has to be
25   zero. It's whether a map is drawn in a way that

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1   treats members of the political parties fairly.
2   And there's a difference between a 2 percent
3   efficiency gap and a 14 percent efficiency gap.
4   Q   **Sure. And are you aware of Simon Jackman's**
5   **reports in this case?**
6   A   Generally.
7   Q   **Have you read them?**
8   A   I -- I've read his first report. I did not give
9   his rebuttal report a very close read.
10 Q   **Are you aware of what his calculations of the**
11   **efficiency gap were for Wisconsin under the 2000**
12   **plan that was enacted by a federal court?**
13 A   I'd have to look at the report. I don't remember
14   off the top of my head.
15 Q   **Are you aware that the average efficiency gap was**
16   **negative 7.5?**
17 A   That sounds -- that sounds roughly correct;
18   although I'm not certain.
19 Q   **And you aren't opining that the federal court in**
20   **the Baumgart case was intending to treat members**
21   **of the different political parties differently,**
22   **are you?**
23 A   No, not at all. In fact, the political science
24   literature on redistricting is quite clear that in
25   a neutral process can produce a nonneutral

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1   outcome.
2   Q   **And so do you have any opinions on why Wisconsin**
3   **saw such a nonneutral outcome in favor of**
4   **Republicans even under a neutral plan in the 2000s**
5   **decade?**
6   A   As I recall describing in my first deposition, I
7   was retained as an expert in that case. And my
8   understanding of how that process evolved is that
9   both the parties to that lawsuit submitted their
10   own plans to the court, which then presumably --
11   although I'm not certain because I don't know for
12   a fact how they went about drawing their maps --
13   incorporated those plans into the judicially drawn
14   map. So I don't know why. I don't know
15   specifically what specific decisions they made.
16   But again, I'm not contesting that a neutral
17   process can produce a nonneutral outcome.
18 Q   **And are you aware that the neutral process**
19   **produced efficiency gaps of negative 12 and**
20   **negative 10 in two different elections?**
21 A   I couldn't say without looking at the report.
22 Q   **So you also wouldn't contest that a neutral**
23   **process could lead to even large efficiency gaps**
24   **in favor of one party?**
25 A   Again, I would want to look at the report before I

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1   would render an opinion on that.
2 **Q   Continuing on in the paragraph we were looking at,**
3   **you say the record in the federal redistricting**
4   **trial clearly shows that Act 43 was designed with**
5   **a predominant purpose of benefitting Republicans**
6   **and disadvantaging Democrats. Okay. And that**
7   **sentence continues on, but I want to focus on**
8   **that.**
9   **So when you say the federal redistricting**
10   **trial, you're referring to the Baldus case?**
11 A   Correct.
12 **Q   And what in the Baldus record shows that Act 43**
13   **was designed with a predominant purpose of**
14   **benefitting Republicans?**
15 A   Well, there was a line in the decision where -- I
16   think it was Judge Stadtmueller who wrote the
17   opinion -- he said that he found the claims of the
18   experts who drew the map that partisanship played
19   no role in their decision, I think the term is
20   "almost laughable."
21 **Q   Now, he said that alleged testimony that**
22   **partisanship played no role was laughable, but was**
23   **there a finding that the purpose was -- the**
24   **predominant purpose was benefitting Republicans?**
25 A   Well, I don't know that that was a fact issue

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1   before the trial. But I think the record is quite
2   clear that the sequence of events and subsequent
3   depositions, if you looked -- I've looked at
4   Professor Gaddie's recent deposition, the denials
5   that this was -- the denials of the people who
6   drew the map that this was not done with partisan
7   intent I simply don't find remotely credible.
8 **Q   And I'm trying to get at what the evidence is that**
9   **the predominant purpose was benefiting the**
10   **Republicans, not just that there was some purpose**
11   **of benefiting Republicans? Do you have evidence**
12   **of that?**
13 A   Well, you can look at the evidence of evolution of
14   the maps, the kinds of partisan analysis that they
15   did, the way in which they assessed the
16   consequences of their maps. And again this is
17   all -- these are all issues that have been
18   established. The secrecy of it, the fact that it
19   was, you know, so tightly controlled, and the
20   examples that I found in my own analysis of
21   packing and cracking.
22   I mean, I think if you lined up a thousand
23   political scientists and look at this map, you'd
24   probably get pretty close to unanimous agreement
25   that this was -- that no one would believe that

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1   this was not done in a manner that was designed to
2   maximize the Republican advantage.
3 **Q   So you think Act 43 is the most advantageous**
4   **Republican plan that could have been enacted?**
5 A   I don't know if it's the most Republican plan, but
6   it's --
7 **Q   Isn't that what "maximize" means?**
8 A   Well, again, I don't know what the -- I'm using
9   "maximum" is that it was not possible to draw a
10   map with more of an efficiency gap, but it's
11   pretty clear that this was about as good as it was
12   going to get.
13 **Q   Do you consider yourself an expert in interpreting**
14   **the records of lawsuits?**
15 A   Can you define what you mean, "records of
16   lawsuits"?
17 **Q   Well, you're the one making an opinion about the**
18   **record of the federal redistricting trial and what**
19   **it shows. I'm wondering where you get your**
20   **expertise to make that opinion.**
21 A   I can read. I can read a judicial opinion. I
22   know what judges say.
23   I have enough experience participating in
24   these trials to know what other social scientists
25   and experts do.

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1 **Q   So it's just based on your own reading of the**
2   **record and the legal decision?**
3 A   The -- so, you know, it's not based on any
4   statutory or issues of judicial philosophy, the
5   sorts of things -- Rules of Civil Procedure or
6   anything else. You have the fact record. You
7   have the maps. You have what they did. You have
8   what the judges said about what they did. And I
9   think that's pretty clear.
10 **Q   And is there any recognized test or method by**
11   **which political scientists go about examining the**
12   **intent of legislatures in designing districting**
13   **plans to determine whether -- what their purpose**
14   **of the plan was?**
15 A   So the -- there are a couple of ways that
16   political scientists do this. Take
17   Professor Goedert, for example. He defines a
18   partisan gerrymander as whenever you have unified
19   control of government which you had here. And my
20   analysis of the plan was based largely on the
21   effects. And this is not an issue of statutory
22   interpretation or legislative intent. This is
23   looking at what the experts and what the people
24   who drew the map actually did in terms of the
25   progression of the maps, how they describe them,

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1   the files, the way that they analyzed them.
2   And based on my experience with 30 years of
3   experience in quantitative analysis and social
4   science, this was a clear indication to me that
5   they were trying out different permutations with
6   the intent of maximizing, if not in a sense of
7   they couldn't do better but getting a very large
8   partisan benefit for their side.
9 Q **And you mentioned trying out the different maps.**
10   **Do you have specific documents or pieces of**
11   **evidence in mind about that?**
12 A Well, not sitting in front of me. But we -- both
13   in the federal trial and also in the recent files
14   that Professor Gaddie talked about and in the
15   Lanterman files, it shows sequences of maps and
16   different names, aggressive and chronological
17   sequence. So that's what I'm referring to in that
18   regard. But I don't have the actual names in my
19   head sitting here.
20 Q **In that chronological sequence, are you offering**
21   **an opinion that they tried many different maps and**
22   **then in the end picked the one that was most**
23   **advantageous to the Republicans?**
24 A I don't know that I can say that based on that
25   chronology, but it has -- certainly has all the

1   hallmarks of that kind of activity. And again,
2   the primary focus of my report is not on intent.
3   The primary focus of my report is on the effects.
4 Q **So we can go to the effects. You say that --**
5   **continuing in the next paragraph in your record --**
6   **that "Trende and Goedert don't quantify how much**
7   **an effect geography has on the efficiency gap."**
8   **Do you have an opinion on how much effect**
9   **geography has on the efficiency gap in your**
10   **demonstration plan?**
11 A Well, there are two things going on in your
12   question. This paragraph is a response to the
13   claim that natural political geography produces a
14   pro-Republican efficiency gap and is an
15   explanation for the efficiency gap that we
16   observe. I noted in this paragraph that they have
17   done no analysis that actually shows that --
18   either that there is a large Republican bias in
19   the political geography or of the state. And even
20   if there was, they had done no analysis that would
21   demonstrate how much of an effect it would have on
22   the efficiency gap. It's simply an assertion
23   without any evidence that because of an
24   asserted -- incorrectly asserted pro-Republican
25   political geography, that that's why you see an

1   efficiency gap. And I disputed both the fact of a
2   pro -- pro-Republican, a large pro-Republican
3   efficiency gap and the political geography and the
4   fact that even if that's true, which it isn't,
5   they were not able to, and did no analysis to
6   quantify how much of an effect that would have on
7   the efficiency gap. It's -- I mean, we simply are
8   supposed to take their word that this is why we
9   see the efficiency gap that we do.
10 Q **And we did see large efficiency gaps under the**
11   **core plan in favor of Republicans based on**
12   **Simon Jackman's work. You'd agree with that;**
13   **correct?**
14 A I would prefer actually to see the report before
15   making a judgment on that.
16 Q **But you would agree that whatever those efficiency**
17   **gaps Jackman calculated, none of the cause was**
18   **partisan gerrymandering?**
19 A It was a judicially drawn map, so --
20 Q **And you haven't offered any opinion on why those**
21   **large efficiency gaps presented themselves under**
22   **neutral plans with no partisan intent at all?**
23 A No.
24 Q **And do you think that -- is it your opinion that**
25   **the Republican legislature, when they took over in**

1   **2010, should have then enacted a plan that had --**
2   **was less advantageous to them than the one that**
3   **had previously been enacted by the federal court?**
4 A That's a question that I'm not in a position to
5   answer. I was not advising the legislature, so --
6 Q **But the demonstration plan you draw is less**
7   **advantageous to Republicans than the federal court**
8   **plan was; correct?**
9 A That's correct. I mean, I'm hesitating because
10   the federal court plan was drawn in 2002. My
11   demonstration plan was done based on the 2010
12   census; so there are some differences there but --
13 Q **We can move on to the next page and go to the**
14   **subheading A for Sean Trende's report. And in the**
15   **first paragraph right underneath sub-A, you**
16   **discount Trende's analysis about other areas of**
17   **the United States like the south and Virginia as**
18   **irrelevant to Wisconsin. Can you explain what you**
19   **mean by that?**
20 A Simply that the political geography of Virginia is
21   not relevant to the political geography of
22   Wisconsin. And it just -- I mean, it has no real
23   relevance to understanding what's happening in
24   this state.
25   In addition, I recall that he also spent

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1   almost all of his time talking about congressional
2   districts, which again does not necessarily give
3   you any insight to state legislative
4   redistricting. So I regarded that as an argument
5   that is just irrelevant to what I did.
6 Q   Because the political geography of other states
7   isn't relevant to the political geography of
8   Wisconsin?
9 A   I mean, if you're interested in the political
10   geography of Wisconsin, you need to look at
11   Wisconsin. I mean, as a social scientist you
12   would never try to make an inference about
13   Wisconsin by looking at a state like Virginia.
14   You would want to look at Wisconsin.
15 Q   Do you think it's appropriate to judge the
16   efficiency gap that Wisconsin sees in reference to
17   the average efficiency gap seen in other states?
18   MR. STRAUSS: Object to the form.
19 A   Well, you're talking about two different things.
20   So in one case we have a measure of something as a
21   quantity of interest. And we can compare that
22   quantity of interest to see how it varies across
23   the state -- across the states. And those kind of
24   interstate analyses are done all the time when
25   you're looking at data on a wide variety of

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1 A   Well, you can't necessarily make that inference
2   because there are several moving parts. You might
3   observe a change because of political geography.
4   You might also observe that change because of
5   gerrymandering. So I don't know, based solely on
6   looking at the efficiency gap in other states over
7   time, whether you can -- again the issue is
8   drawing an inference about what's happening in
9   Wisconsin. And you can get some information about
10   what is happening or what the characteristics of
11   the quantity you're interested in measuring are.
12   But you would -- you would not, I don't think, be
13   able to, or would want to make the argument that
14   because something is happening in another state it
15   must be happening in Wisconsin. And that's
16   essentially what Trende did.
17 Q   You also took issue with his use of the county
18   votes. How far back does ward-level vote data go
19   in Wisconsin?
20 A   I think if you went to the Blue Book, you could go
21   back many decades. I think --
22 Q   And the Blue Book data by county?
23 A   Well, Blue Book contains -- I'm working from
24   memory here, but my recollection is the previous
25   editions of the Blue Book contain presidential

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1   states. But the way that Mr. Trende does it is to
2   make an assertion that Republicans are more
3   favorably dispersed than Democrats in Wisconsin.
4   And to use that to -- to make that argument he
5   looks at other states. And that's an
6   inappropriate -- he's not comparing the
7   distribution of partisans in Virginia and
8   Wisconsin. He is making the claim that because he
9   asserts partisans are distributed in a particular
10   way in Virginia, that that tells you how they are
11   distributed in Wisconsin. Where the proper
12   technique would be to look at the differences
13   between the two states and try to make inferences
14   from that. But even that would require you to
15   have an accurate measure of those distributions,
16   which he does not.
17 Q   Would you say that analysis of other states in
18   areas of the country would be relevant to
19   analyzing trends in the efficiency gap nationally?
20 A   I'm not sure what you mean by nationally. Do you
21   mean coming up with a national efficiency gap
22   or --
23 Q   Sure. Like trends that show the efficiency gap
24   is -- the average efficiency gap is moving towards
25   the Republican favor across all states.

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1   vote by ward, and they may also have in some years
2   the Assembly vote by ward. So the ward-level data
3   goes back quite a ways.
4 Q   Do you know how far back?
5 A   I don't.
6 Q   But you're referring to the Blue Book. So we
7   could look at the Blue Books and whatever is there
8   would be what's there; correct? You're basing
9   your memory of what you think the Blue Book
10   contains; is that correct?
11 A   That's correct.
12 Q   So we would have to actually look at the
13   Blue Books and that would resolve our question;
14   correct?
15 A   Yes.
16 Q   You agree that the partisan index shows which
17   areas of the state are more Democrat or more
18   Republican than the state as a whole; is that
19   correct?
20 A   I just want to be precise that the way that Trende
21   uses the partisan vote index is that it shows you
22   how a particular geographic area compares to the
23   state as a whole. So, you know, area needs to be
24   specified or region needs to be specified in order
25   to make that statement.

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1 Q So a partisan index done on the ward level shows
2   you how much more Democratic or Republican that
3   ward is in the state as a whole?
4 A Again, there are a number of assumptions that are
5   built into that depending on what election you're
6   looking at. But in a particular election it will
7   tell you what the PVI does is it simply
8   renormalizes the distribution of ward-level votes
9   around the statewide average.
10 Q And if you would do that for a county, it would be
11   the same concept, just at a different geographic
12   level?
13 A As he calculated it, that's correct.
14 Q And you could also use that for, like, a
15   congressional district or a state legislative
16   district; is that correct?
17 A Yes.
18 Q You say "PVI" -- moving to page 5 -- "is almost
19   exclusively used by political commentators to
20   describe congressional districts. And you say
21   "it's not used in the context of state legislative
22   redistricting."
23   Why would a measure that's used for
24   congressional districts not be applicable to state
25   legislative redistricting?

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1 A The primary problem is that the PVI is not really
2   used in redistricting at all. What the PVI is
3   generally used for is simply as a metric of how a
4   particular area or congressional district, which
5   is the Cook PVI, which is how it was originally
6   developed to talk about the competitiveness of a
7   congressional district. It doesn't give you any
8   purchase in evaluating hypothetical plans. It
9   doesn't give you any way of evaluating or
10   transferring from one level of geography to
11   another. And the only references that I found in
12   the academic literature were as a purely
13   descriptive variable or a descriptive measure of
14   the level of the competitiveness of congressional
15   districts. I have never seen it used in the
16   context of analyzing state legislative
17   redistricting plans. And I note that Trende
18   didn't cite any studies, and he could not identify
19   any studies where it was so used.
20 Q Is it your opinion that if something's not used in
21   a study, then it's not helpful at all in analyzing
22   a particular issue?
23 A My view is that a metric that is used almost
24   exclusively by political commentators and for a
25   very narrow purpose does not give you a way to

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1   make reliable inferences, particularly when there
2   are much more widely accepted and accurate
3   measures of analyzing redistrictings.
4   So the short answer is yes, the fact that it
5   hasn't been used in academic study means that it
6   doesn't give you much purchase. The longer answer
7   is that there's a reason for that that political
8   commentators are trying to describe. They are
9   using shorthand. Whereas, in the scholarly
10   literature people are trying to make reliable
11   inferences about empirical effects. And the PVI
12   is simply not useful in that regard.
13 Q Is it your understanding that Trende was using the
14   PVI to analyze the Wisconsin districting plan?
15 A He was using the PVI as a way of describing
16   geographic clustering, which is also incorrect
17   because things like the PVI are not used in the
18   literature on spatial analysis in geography. So
19   again, it's a metric that is used in one context.
20   And in my view, Trende was inappropriately
21   applying it to other contexts where it is not
22   applicable.
23 Q Do you think it's not even helpful to look at the
24   change over time in the state to see which areas
25   have become more Republican or more Democratic

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1   over time?
2 A I don't think it's useful for that. There are
3   much better indicators that will give you much
4   more reliable information about what's actually
5   going on.
6 Q And what are those indicators?
7 A The indicators that -- the indicators that I use
8   which are among the measures used by geographers,
9   the Moran's I and the Isolation Index, just to
10   give two.
11 Q And we'll get to that. Moving down to the next
12   paragraph, you mention two errors, and one of them
13   is the top-of-the-ticket race in 2006. You said
14   it was used -- using the Senate race instead of
15   the governor's race. So if you redid that
16   analysis in the 2006 race using the governor's
17   race, would that correct that error?
18 A I don't know. I took that as an indicator of
19   methodological carelessness because, as I noted in
20   my report, there are different views about what
21   constitutes the correct top-of-the-ticket race
22   when we're in a midterm year. Some people argue
23   that the gubernatorial race is better, others that
24   the Senate is better. My objection is that he
25   switched. He used gubernatorial election in some

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1   years and the Senate election in 2006. And given
2   the fact that those two elections were
3   significantly different in terms of their
4   competitiveness, I think 2006 was 53 or
5   52 percent, looking at my report 53.8 percent
6   Democratic, and the Democratic Senate race was
7   60.5, that's a material difference.
8 Q Do you know how that difference affected any of
9   his calculations?
10 A I don't.
11 Q And then you note an error in the code. Do you
12   know between 2004 and 2012, moving on to the next
13   set of paragraphs, do you know how that error
14   affected Trende's analysis?
15 A Again, I took it as a sign that he was not doing
16   reliable analysis because these are not the sorts
17   of errors that a careful social scientist would
18   make. I mean, it was just -- I don't know whether
19   it was carelessness or what, but I take this as an
20   indicator that he was not going about the process
21   of doing this analysis correctly.
22 Q Turning to the next page, look at figure A. And
23   I'll get my color copy out since this one is in
24   color. Could you explain what this figure shows?
25 A This figure is a graph of the average Democratic

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1   vote in Democratic wards, meaning it's the average
2   Democratic vote in a ward where the Democrats
3   receive more than 50 percent of the vote in the
4   top ticket race as well as the Republican --
5   average Republican vote share in pro-Republican
6   wards. And this is a more direct measure of
7   partisanship. And it shows that between 2002 and
8   2014, that Democratic wards and Republican wards
9   both became more Republican or Democratic over
10   time. And this in my view contradicts Trende's
11   assertion that Democratic wards have become more
12   Democratic while Republican wards have not become
13   more Republican.
14 Q Now, does this graph tell you how many democratic
15   wards there were in a particular year?
16 A No.
17 Q Or republican wards? It's just the average of all
18   wards?
19 A That's correct.
20 Q Now, when I look at this graph, I see it goes from
21   2002 to 2014. Why did you start at 2002?
22 A I could have started earlier. That was just -- it
23   may have been because that's when Trende started
24   his.
25   Give me a second here. I think I used 2002

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1   because -- to 2014 because that's what Trende did.
2   So I was simply trying to replicate over a similar
3   time period.
4 Q And in looking at this graph, in 2002 the
5   Republican average ward is 60 and a half percent;
6   is that about right?
7 A That looks about right.
8 Q And then in 2004 for the Republicans, following
9   the red line, it's actually less than that. Goes
10   down to about 60 percent?
11 A That's about right.
12 Q And then in 2006, it goes down to 59 percent?
13 A That's correct.
14 Q And then in 2008, it goes down to 58 and a
15   half percent about?
16 A Roughly.
17 Q And then 2010, it jumps up to 62 and a
18   half percent or so?
19 A Yes.
20 Q And then 2012, which is the year you had
21   calculated the efficiency gap for, it goes back
22   down to about 60, maybe a little bit higher than
23   60 percent; correct?
24 A Correct.
25 Q So if I'm reading this correctly, from 2002 to

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1   2012, there's no change in the Republican -- the
2   average Republican vote in a Republican ward other
3   than in the 2010 election?
4 A Well, I mean, you can look at a graph like this
5   and cherry-pick your starting and stopping point.
6   The point I was trying to demonstrate is that over
7   the range of time that Trende was doing his
8   analysis, that he was insisting that the Democrats
9   had become far more concentrated. And this is a
10   graph that shows over that period that that's not
11   so. And it's also to keep in mind that this is
12   not a graph that goes with the X axis from zero to
13   100. So even at the maximum difference we're
14   talking about a little over 2 percentage points or
15   3 percentage points.
16 Q And I'm just going to go through the same exercise
17   with the Democrats. They start out at 61 maybe
18   .25 or something like that in 2002?
19 A Roughly.
20 Q And then they go down in 2004 to about maybe
21   1 percentage point or so to 60.25 about?
22 A Correct.
23 Q And then they go back up in 2006 to 61 percent?
24 A Correct.
25 Q And then in 2008, it's 62 and a half

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1   maybe percent?
2 A   Roughly.
3 Q   And then 2010 maybe -- it goes down a little bit
4   but maybe 60.25 or something; is that correct?
5 A   Roughly.
6 Q   And then 2012, it's up a little bit again to 62
7   and a half or so?
8 A   Correct.
9 Q   And then 2014, it's about 63 -- I don't know,
10   probably doesn't get up to a half but over
11   63 percent; correct?
12 A   That's correct.
13 Q   And then Republicans are also over 63? They're
14   about 63 and a half in 2014?
15 A   Correct.
16 Q   Now, the particular wards that fall into a
17   Democratic or Republican ward in each year don't
18   remain consistent across the years; is that
19   correct?
20 A   There's no requirement. They can change.
21 Q   So, for example, a ward that was 51 percent
22   Democratic in one year and then flipped to be
23   51 percent Republican in the next election would
24   go from being a part of the blue line data to part
25   of the red line data?

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1 A   That's correct.
2 Q   But you would admit that from 2002 to 2014, the
3   average Democratic vote in a Democratic ward has
4   increased?
5 A   I would look at this graph and say that the
6   average Democratic vote in a Democratic ward
7   increased, but the average Republican vote in a
8   Republican ward increased over that same time
9   period even more. So I look at this and see that
10   movement is roughly equivalent over the full range
11   of the time period.
12 Q   And that's ending -- is that based on the ending
13   point in 2014?
14 A   Correct.
15   MR. KEENAN: Can we just take a
16   short break right now?
17   THE WITNESS: Sure.
18   (Recess)
19 By Mr. Keenan:
20 Q   We'll go back on the record and we'll move on to
21   the Section 2 here about the nearest neighbor. I
22   was going to flip forward to page 7. And I'm
23   looking at the last full paragraph, the second to
24   the bottom. And you say that, "Trende's method
25   tells us nothing about which wards are actually

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1   adjacent to wards of a certain PVI."
2   Is it your opinion that wards that are close
3   together but not adjacent would likely not be
4   districted together?
5 A   My opinion is that the way in which Trende
6   conducts this analysis does not lead to any
7   reliable conclusions about levels of concentration
8   because we have no information about how close
9   wards are. And the way that he applies it is a
10   methodology that I've never seen in the geography
11   literature. And there's lots of people who do
12   nearest neighbor analyses of populations, but I've
13   never seen it done in this manner. And so my
14   criticism of the method is that his -- this metric
15   of the median distance of wards of a similar
16   partisan lean tells us nothing useful with regard
17   to either redistricting or concentration of
18   different populations.
19 Q   So absolutely nothing? Just because they're not
20   adjacent to each other?
21 A   Well, that's one problem. There are a number of
22   others.
23 Q   You say that, "Likewise, it's entirely possible
24   that wards of the same partisan make-up are close
25   together but quite difficult to combine in the

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1   same district." It has in parentheses "think of a
2   densely populated but politically heterogeneous
3   area."
4   Do you have any particular area in mind there
5   in the state of Wisconsin that would fit that
6   criteria?
7 A   Not off the top of my head, no.
8 Q   In fact, in Wisconsin aren't the densely populated
9   areas actually politically homogeneous?
10 A   Well, I don't know that I'm prepared to make that
11   statement. But to the degree that there are
12   homogeneous areas, that they concentrate Democrats
13   and Republicans in roughly equal measure.
14 Q   The city of Milwaukee is a densely populated area,
15   is it not?
16 A   That's correct.
17 Q   And that is politically homogeneous in favor of
18   the Democrats; is that correct?
19 A   I would say for the most part, yes.
20 Q   And then the city of Madison is also a densely
21   populated area; correct?
22 A   Probably not as densely as Milwaukee.
23 Q   Sure. But compared to the rest of the state, it's
24   densely populated?
25 A   Well, I mean, I haven't actually looked at the

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1   specific density figures of number of people per
2   square mile, but that's plausible certainly.
3 Q   And then the city of Madison also is politically
4   homogeneous, and it's in favor of the Democrats;
5   is that correct?
6 A   That's correct.
7 Q   Are you aware of any similarly sized cities in
8   Wisconsin that -- or even counties that are as
9   strongly Republican as the city of Madison, city
10   of Milwaukee are strongly Democratic?
11 A   Well, that's not the only measure. There are
12   areas that are -- have roughly equivalent
13   concentrations: Waukesha County, Ozaukee County,
14   Washington County. So again, using the accepted
15   measures of political concentration and
16   segregation, those measures show that Republicans
17   and Democrats as a whole are concentrated in
18   roughly equal measures.
19 Q   Do Waukesha, Ozaukee, the other Republican
20   counties you mentioned vote in favor of the
21   Republican candidates at the same level that the
22   city of Madison and the city of Milwaukee vote in
23   favor of Democratic candidates?
24 A   Not to the same degree.
25 Q   They're slightly less -- they are less favorable

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1   to Republicans; is that correct?
2 A   That's correct.
3 Q   So when districting, either strongly Republican or
4   strongly Democratic areas -- for example,
5   Waukesha County, when you district that the
6   Assembly is likely to produce all Republican
7   seats; is that correct?
8 A   Sorry is, say that again.
9 Q   When districting the Assembly and districting
10   Waukesha County, that's likely to produce seats
11   that are Republican seats; is that correct?
12 A   Correct.
13 Q   And then districting Milwaukee, you're likely to
14   district -- whichever way you do it is likely to
15   result in Democratic seats; is that correct?
16 A   That's correct.
17 Q   And then in doing that, you'll have safe seats for
18   both parties; is that correct?
19 A   Well, I'd say that probably, but I would want to
20   do the analysis to make sure. But that certainly
21   sounds reasonable.
22 Q   And given that Milwaukee votes for the Democrats
23   at higher levels than Waukesha votes for
24   Republicans, aren't there going to be more wasted
25   votes in Milwaukee for the Democratic legislative

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1   candidates than there are in Waukesha for the
2   Republican legislative candidates?
3 A   Well, I'm going to take issue with the premise
4   because the efficiency gap is not calculated based
5   on a region of the state. The efficiency gap is
6   calculated statewide. So the fact that there are
7   more wasted votes in one area than another area by
8   itself doesn't tell you what the statewide
9   efficiency gap would be. So that's not a useful
10   inferential method.
11 Q   But those will be components of a statewide
12   efficiency gap; correct?
13 A   That's correct.
14 Q   And then in districting the rest of the state,
15   won't the legislatures have to make up the
16   difference for the excessive wasted votes in the
17   city of Milwaukee compared to the wasted votes in
18   the county of Waukesha?
19   MR. STRAUSS: Object to the form of
20   the question.
21 A   I'm going to dispute the term "excessive."
22 Q   They're larger, aren't they?
23 A   Well, but there's a difference between larger and
24   excessive.
25 Q   That difference has to be made up somewhere to get

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1   a balanced map across the state; correct?
2 A   That's correct. Although based just on that, we
3   don't know how -- you know, what the difference in
4   wasted votes would be.
5 Q   If we can go to page 9, and Table A shows that
6   Democratic wards are of smaller square mileage
7   than Republican wards; that's correct?
8 A   That's correct.
9 Q   And that is particularly true in the city of
10   Milwaukee which has a mean square mileage per ward
11   of only 0.29 square miles?
12 A   Correct.
13 Q   And the median is 0.20 miles; correct?
14 A   Correct.
15 Q   And so you say that his method will always show
16   that Democratic wards are closer to Republican
17   wards because Democratic wards are smaller; is
18   that correct?
19 A   Correct.
20 Q   Then you take issue with his use of the mean and
21   the median. Why don't I just have you explain
22   what your problem is with using one or the other
23   in what Trende did.
24 A   So the issue with the way that he conducts his
25   analysis is that he puts his thumb on the scale

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1   twice in ways that guarantee that the analysis
2   will show that Democrats are far more concentrated
3   than Republicans. The first objection which we
4   just talked about was the failing to account for
5   the fact that wards have different areas. And in
6   the geography literature it is unanimously agreed,
7   I would say, that you have to be cognizant of
8   different geographic. The areas of different
9   aggregations, that you can't simply do an analysis
10   of an area -- of a region with different areas
11   because you will not get reliable results.
12   The objection for the use of the mean and the
13   median is that Trende doesn't provide any real
14   justification for why he uses the median as
15   opposed to the mean; both of which are measures of
16   central tendency. Trende argues that he uses the
17   median to avoid having outside -- outlying areas
18   have disproportionate influence, and he uses the
19   example of Menominee County. And on its face that
20   doesn't make any sense because when you say an
21   area is outlying, you have to describe it as
22   outlying in terms of what. Menominee County is
23   not an outlying area if we're talking about
24   Appleton. It's an outlying area if we're talking
25   about one of the extreme areas of the state. So

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1   that as a simple empirical statement it's a
2   non sequitur.
3   The bigger problem is that by using the
4   median and the fact that the -- we know that wards
5   that vote Democratic are on average about -- are
6   smaller than wards that vote Republican. If we
7   look at the -- and that will have significant
8   effect on any calculations of distance because,
9   all other things being equal, two larger wards,
10   their centroids will be farther apart than two
11   small wards. And so that's one source of bias
12   that's already in his analysis.
13   The second problem is that in using the
14   median rather than the mean, what I show in
15   Table A is that the average -- the mean Republican
16   ward is a little less than twice as large as the
17   mean Democratic ward, 10.96 as opposed to 5.91.
18   The median ward, Republican ward, is almost seven
19   times as large, or six times as large as the
20   median Democratic ward, 0.56 square miles as
21   opposed to 3.45 square miles for the median
22   Republican ward. So not only is he introducing a
23   crippling bias by failing to control for ward
24   area; the fact that he uses the median rather than
25   the mean simply compounds that to produce a result

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1   that simply guarantees that he is going to find
2   that Republican wards are farther apart than
3   Democratic wards.
4   I mean, this is an analysis that would simply
5   not be taken seriously by anybody who was familiar
6   with the literature.
7 **Q Because Democratic wards just are smaller to begin**
8   **with?**
9 A No. It doesn't have anything to do with
10   Democratic and Republican wards. It has to do
11   with the fact that he's failing to control for
12   crucial variables that he needed to control for.
13 **Q Why do you need to control for them?**
14 A Because if you are looking at distances and
15   distances between geographic areas, you need to
16   account for the fact that those areas might be of
17   different size.
18 **Q Now, compactness is a factor in districting;**
19   **right?**
20 A It is a traditional redistricting principle.
21 **Q Is there an adjustment or control done for**
22   **compactness?**
23 A Well, no. Because compactness is size and
24   variant. You can have a small compact district.
25   You can have a large compact district. You can

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1   have a small noncompact district. You can have a
2   small -- a large noncompact district. Compactness
3   is not a measure of distance. Compactness is
4   essentially a measure of area ratios. So the
5   physical size of a district is not comparable to
6   accounting for the physical size of wards because
7   we're not interested in the distances between two
8   districts. Compactness is a measure of their
9   shape.
10 **Q Are highly Democratic wards likely to be close to**
11   **each other? Do you dispute that?**
12 A On a statewide basis, what I will say is that
13   accepted metrics of geographic concentration show
14   that Democrats and Republicans are clustered in
15   roughly equal measure.
16 **Q And do you have an opinion how easily it would be**
17   **to district heavily Democratic districts with --**
18   **or heavily Democratic wards with**
19   **Republican-favoring wards?**
20 A Can you say that again?
21 **Q Sure. Is it difficult in Wisconsin to include in**
22   **a same Assembly district very heavily Democratic**
23   **wards along with Republican-tilting wards?**
24 A Well, let me -- I'm going to ask you to be more
25   precise here because are we talking about as a

1   whole or in some areas? Because I'd ask you to be
2   more precise.
3 Q How about both. If you think there's a
4   difference, you can answer it two different ways.
5 A So there will be some areas where you -- well, in
6   some areas it would be relatively simpler to
7   maintain partisan homogeneity. In other areas it
8   would not be simple. And I was able to produce
9   quite a number of districts that were balanced.
10   So I don't regard the premise that in some places
11   Democrats are concentrated as a barrier to
12   producing a map that treats Democratic and
13   Republican voters equally.
14 Q When you say treating them equally, what do you
15   mean?
16 A That's the notion of partisan symmetry. In terms
17   of redistricting, the idea is that Democrats and
18   Republicans have an equal opportunity to see their
19   votes translated into seats. They're treated
20   equally in that regard.
21 Q And that's on a statewide basis?
22 A Correct.
23 Q And that might require, you know, some Democrats
24   get districted in a district with Republicans
25   where they would lose and then where they wouldn't

1   blue lines represent Democrats; is that correct?
2 A That's correct.
3 Q So when you redid it with the medians, you still
4   found that Democratic wards are closer together
5   than Republicans?
6 A Let me correct you. I didn't redo it with the
7   medians. I redid it with the means.
8 Q You found with the means the Democratic wards were
9   still closer together than the Republican wards?
10 A That's true. But that could well be because of
11   the fact the Democratic wards tend to be smaller.
12   We're dealing with a measure of distance here.
13 Q And the -- I mean, in comparing the two sets of
14   lines so that the two dotted lines compare to each
15   other and then the two solid lines compare to each
16   other, is there anything about those shapes of
17   those lines that you have an opinion on about
18   changing from the median to the mean that results
19   in a change in analysis?
20 A Sure. There are two differences here. The dotted
21   lines, which is simply a replication of Trende's
22   median analysis, is the basis for his opinion that
23   as Democratic wards become more Democratic they
24   get closer together, and as Republican wards
25   become more Republican they move farther apart.

1   be able to vote for a Democratic candidate for
2   themselves?
3 A Are you saying they wouldn't have an opportunity
4   to vote for a Democratic candidate?
5 Q No. I mean, the important key here is the
6   statewide impact, correct, on the legislature?
7 A That's what the efficiency gap measures. It's a
8   statewide measure.
9 Q But district by district, that may result in
10   different decisions being made about districting
11   certain people in and out of districts where, for
12   example, a Democratic voter might have to be
13   placed in a district that would vote for
14   Republicans in order to achieve a greater
15   statewide balance?
16 A As an empirical matter, in drawing districts,
17   there's no guarantee that you're going to be
18   placed into a district that will always vote for
19   the candidate that you like.
20 Q And let's go to figure B. As I understand it, so
21   the dotted lines are the median nearest neighbors,
22   and the solid lines are the mean nearest
23   neighbors; is that correct?
24 A That's correct.
25 Q And the red lines represent Republicans and the

1   And that's the sort of hockey stick on the left
2   side of the graph for Republican wards. I've
3   noted my objections to both the foundation of this
4   analysis and the fact that he used means rather
5   than medians -- or medians rather than means. And
6   when I redid the analysis with the means, the
7   shapes of the line are essentially completely
8   parallel. These are the same shapes that it shows
9   for both Republicans and Democratic wards. As
10   wards become more Republican and more Democratic
11   they get farther apart in terms of their mean
12   distance.
13   The fact that Republican wards, the distances
14   between Republican wards of the same partisan lean
15   are farther apart than Democratic wards of the
16   same partisan lean I take as a function of the
17   differences in ward areas. And again you can see
18   the effect that the distance between Republican
19   wards is about -- it's not quite two, maybe one
20   and a half times larger than the mean Democratic
21   distance. In terms of the median we're talking
22   about a difference of about three. So both the
23   pattern or the relationship between partisanship
24   and distance becomes the same. The relative
25   difference between the distances between

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1   Republican wards and Democratic wards also
2   shrinks. And so I took this as yet another
3   indicator that what Mr. Trende did was not a
4   reliable methodology that provides useful
5   information about the geographic clustering of
6   Democrats and Republicans.
7 Q   Let's move on to Section B which is Goedert's
8   report. Why don't you explain your criticism of
9   Goedert's use of the wards and you reference the
10   modified areal unit problem. Why don't you
11   explain that criticism you made.
12 A   So where are we?
13 Q   Sure. On page 11, it's like the third paragraph
14   under Section B.
15 A   So we're talking about Goedert's analysis of the
16   uniform swing?
17 Q   Yes, in the wards.
18 A   So like Trende, Goedert makes an argument that
19   Democrats are clustered and Republicans are
20   distributed in a way that's favorable for
21   redistricting purposes. He didn't actually
22   conduct any analysis that demonstrates that, but
23   the example that he gives or the data that he uses
24   is an attempt to show that in a tied election --
25   so he took the 2012 ward level vote for the

1   president, and subtracted the 3.5 percent, he
2   conducted a uniform swing analysis. So in 2012,
3   the Democratic vote for president statewide was
4   53.5 percent. And so in doing the uniform swing
5   he subtracted that 3.5 percent from every ward.
6   And then he did a histogram. And that's the red
7   line in figure C. It's not really -- it's a
8   kernel density graph, which is essentially a
9   smooth histogram. And what Goedert argues is that
10   this distribution of wards -- he argues -- I think
11   the exact term that he uses is that in a tied
12   election Republicans would win 60.2 percent of
13   wards in a tied election. And that's the basis
14   for his -- the shape of that graph.
15   So this graph, as you move right on this
16   graph, wards become more Democratic. So anything
17   below 50 percent is a ward that the Republicans
18   would win in a tied election under this uniform
19   swing analysis.
20   My objection to this is that elections are
21   not determined at the ward level. Elections occur
22   in wards that are aggregated into districts. And
23   if you actually do the analysis at the district
24   level, so you do his uniform swing analysis and
25   use his results at the ward level and then

1   aggregate those wards into the Act 43 districts,
2   you see a very different pattern, in that in a
3   50 percent election Democrats-only win, what is
4   the -- I don't know if I actually calculated how
5   many -- so what this shows is once you aggregate
6   the wards into districts, the pattern completely
7   changes. That you have the average, the mode, the
8   skew, it changes. And this is a classic example
9   of what geographers call the modified areal unit
10   problem, which is that when you are dealing with
11   different levels of geography, inferences that you
12   draw at one level, in this case the wards, can
13   often be very different when you aggregate those
14   lower levels of geography into larger levels of
15   geography as in districts.
16   And my argument here is that the ward-level
17   analysis in terms of what Goedert did, that
18   focusing on the wards is the wrong unit of
19   analysis. You need to focus on the districts.
20   And this is in fact precisely the pattern that you
21   see in Act 43, which is you take a large number of
22   Democratic votes and you aggregate them in a way
23   that provides significant advantage to
24   Republicans, so that in a 50 percent tied
25   election, Democrats -- the mean Democratic vote,

1   or the mode -- modal Democratic vote would be
2   about 40 percent at the district level.
3 Q   And do you dispute that that's an identical result
4   of what we saw under the 2000's core drawn plan?
5 A   I haven't done the analysis. I can't say.
6 Q   Now, you would agree that whoever is doing the
7   districting is taking wards and then aggregating
8   them into districts; that's correct?
9 A   That's actually not what occurred in 2011. That
10   had been the normal practice where the
11   municipalities and counties would draw their wards
12   and then those would be aggregated into districts.
13   In 2011 and 2012, the pattern was that the
14   districts were drawn first and then the wards were
15   required to conform to the district lines. So
16   that's not how it happened in 2012.
17 Q   But when you drew your demonstration plan, did you
18   select particular wards and then place them in
19   your districts?
20 A   I did not.
21 Q   Okay. How did you do it then?
22 A   I built my districts using essentially census
23   blocks.
24 Q   Eventually did you then use wards that go into
25   your districts?

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1 A   I did not.
2 Q   So is it possible that your districts don't line
3   up with the wards that are in --
4 A   In my demonstration plan?
5 Q   Correct.
6 A   I imagine they don't.
7 Q   Now, are you offering an opinion on -- we see the
8   red line, the distribution of wards -- how that
9   should then translate into a distribution of
10   districts?
11 A   No. This was a critique of Goedert's argument.
12   What I was trying to show, that the assertion that
13   he makes that -- this is part of his argument that
14   Republicans have a favorable geographic
15   distribution around the state that produces a
16   natural pro-Republican gerrymander. And this is a
17   criticism of his analysis to say that this
18   actually doesn't give you useful information that
19   allows you to make reliable inferences about
20   geographic concentration. I'm not -- this is not
21   something that I used in terms of making my own
22   criticisms of Act 43. This is a criticism of
23   Goedert's analysis.
24 Q   So are you -- and I take it your red line -- does
25   your red line track when Goedert's analysis was?

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1 A   I attempted to replicate what he did, which is his
2   ward-level analysis weighted by population in a
3   tied election.
4   MR. STRAUSS: Just to be clear,
5   you're talking about the red line in Figure C
6   on page 12 of Professor Mayer's report?
7   MR. KEENAN: Correct.
8   MR. STRAUSS: Okay.
9 Q   Are you disputing that Goedert accurately
10   calculated both the number of wards or the share
11   of population in the population he did in his
12   report?
13 A   Can I look at the report?
14 Q   Sure. I have a copy here. It was marked as
15   Exhibit 17. And I believe it's on page 22.
16 A   So I will profess to being agnostic as to whether
17   Dr. Goedert did this analysis accurately. My
18   view, it doesn't matter. Even if he did it
19   accurately, it doesn't provide you with any
20   reliable means for making inferences about the
21   geographic distributions of partisans in
22   Wisconsin.
23 Q   Okay. Even the fact that there's more Democrats
24   in wards with 80 percent or greater Democratic
25   support than there are Republicans in wards with

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1   80 percent or greater Republican support?
2 A   Again, the point of Goedert's analysis is he's
3   trying to make the argument that Democrats are
4   more concentrated than Republicans. The way that
5   he did that analysis doesn't show what he says it
6   shows. In fact, I demonstrated that using
7   reliable methods of measuring geographic
8   concentration in isolation, they show that
9   Democrats and Republicans are concentrated and
10   clustered in the state in roughly equal measure.
11   So my overall argument is that both Goedert
12   and Trende are simply incorrect in arguing that
13   Democrats are more clustered than Republicans.
14 Q   Let's go to sub-1 about Goedert's published work.
15   What's your understanding of what Goedert's model
16   was intended to do, the one that you're using in
17   this section of your rebuttal report?
18 A   Let me refresh my memory here. So my
19   understanding of what Goedert did in these two
20   articles was to assess the effect of different
21   underlying factors such as gerrymandering, and
22   what he says is urbanization, which in this regard
23   is a proxy for concentration. And in 2014, he
24   found that in states with unified Republican
25   control, which he took as the definition of a

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1   gerrymander, a Republican gerrymander, even after
2   controlling for urbanization, which in this
3   context urbanization is largely considered in this
4   context to be a proxy for Democratic
5   concentration, he finds that even after
6   controlling for urbanization, Republican-drawn
7   maps have a larger pro-Republican bias,
8   significantly larger pro-Republican bias.
9   He then updated that model. The original
10   model was based on 2012 data. He updated his
11   model after 2014. And in 2015, he found that
12   using essentially the same model for congressional
13   districts, that urbanization no longer has a
14   significant effect on the bias, which it's not
15   quite the same thing as the efficiency gap, but
16   it's the same -- more or less the same idea. And
17   so I used this to point out that his own work
18   comes to different conclusions about the fact of
19   urbanization, sometimes it matters, sometimes it
20   doesn't. But that even when you take urbanization
21   into account, using that as a control variable in
22   his regression model, he still finds that
23   pro-Republican gerrymanders produce significant
24   pro-Republican bias. So that's my understanding
25   of -- and my interpretation of what he did.

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1 Q And then that was directed at congressional seats;
2   correct?
3 A Correct.
4 Q It wasn't state legislative seats?
5 A Correct.
6 Q Now, do you understand that he also found that
7   Democrats did not achieve the advantage one would
8   expect from controlling the districting process
9   and that they underperformed what one would expect
10   in terms of getting seats?
11 A I would have to go look at the report. I don't
12   recall that off the top of my head.
13 Q I have both of these here. They were previously
14   marked as Exhibit 20 and 21. Exhibit 20 is his
15   2012 article.
16 A Actually it's 2014, I think.
17 Q And then 21 is the 2014 -- or I mean, it may have
18   been published in 2014, but it was about the 2012
19   elections.
20 A I have 20. I don't have 21.
21 Q It's right here.
22 A Oh, here we go.
23   MR. STRAUSS: And what's the
24   pending question?
25 Q So if you can turn to the first page of text --

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1 Q And then you go on to use his model and plug in
2   Wisconsin's information in that; correct?
3 A Correct.
4 Q Now, are you offering an opinion that the model
5   for the congressional seats applies to the
6   Assembly seats in Wisconsin?
7 A Not in this context, no.
8 Q So then what is your opinion -- what inference can
9   we draw about Goedert's model for the 2012
10   congressional elections in using Wisconsin's data?
11 A My inference is that when you take his actual
12   model that he developed and you apply it to
13   Wisconsin, you get an anomalous result. If you
14   take the values of the independent variables as
15   they exist in Wisconsin and you generate the
16   predicted bias using that model in Wisconsin, his
17   model predicts that you would get a pro-Democratic
18   bias. And so I take this as an indication that
19   his model does not provide much of a foothold in
20   explaining or supporting the assertion that there
21   is a pro-Republican natural geographic bias in
22   Wisconsin.
23 Q And do you think that would apply to the Assembly
24   districts?
25 A I would have to -- I would have to do the

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1   MR. STRAUSS: In which exhibit?
2   MR. KEENAN: 20.
3   MR. STRAUSS: Okay.
4 Q And if you go to the third paragraph in the text,
5   it says, "However, the problem for Democrats might
6   actually be more fundamental. The current
7   geographic distribution of partisans now leaves
8   Democrats at a disadvantage as long as
9   congressional representation is based on
10   contiguous geographic districts. It is
11   unsurprising that Republicans won more than their
12   fair share of seats where they drew the maps.
13   However, Democrats also underperformed in their
14   bipartisan maps and gained only small advantages
15   from their own maps, suggesting the main issue is
16   not gerrymandering but districting itself."
17   Are you saying that that conclusion is wrong?
18 A I'm saying that that conclusion doesn't
19   necessarily apply to Wisconsin because, again,
20   when you are looking at actual measures of
21   geographic concentration in isolation in
22   Wisconsin, you find that the partisans, Democrats
23   and Republicans, are concentrated and isolated in
24   roughly equal measure. And I don't know that I
25   would draw that inference as he did it.

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1   analysis. But again, my position is that this
2   method that he uses does not give you reliable
3   information about the scope of geographic
4   concentration in Wisconsin. And there are
5   accepted ways of doing that analysis which I did.
6 Q And you understand we're not -- the congressional
7   map here is not under challenge, is it?
8 A I understand.
9 Q And the congressional map has swung between like
10   three, four, and five seats for each party over
11   the last 15 years or so; is that correct?
12 A I don't know.
13 Q So is there anything at all we can take from a
14   model that is designed to describe how districts
15   of 700,000 people might perform and compare it to
16   99 districts of about 57,000 people would perform?
17 A Well, no. But the reason I cited this article is
18   to say that Goedert's argument about geographic
19   concentration is actually not consistent with his
20   own work.
21 Q But how is it inconsistent when he's talking in
22   one instance about Assembly seats and then another
23   about congressional districts?
24 A Well, it is that when he has looked at
25   gerrymandering, that the effect of urbanization --

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1   it's an argument by analogy. And again, I'm not
2   using this as a way -- it forms no part of my
3   analysis that there is or is not geographic
4   clustering in Wisconsin. It's simply a criticism
5   of Goedert who is simply asserting, in the absence
6   of any actual reliable evidence, that there is a
7   pro-Republican geographic bias. The argument is
8   that this is an argument that is inconsistent with
9   what he has made in other contexts.
10 Q I still don't see how it's inconsistent, though,
11   if one method is dealing with congressional seats
12   and the other method is dealing with Assembly
13   seats, but -- then you also perform an analysis
14   using Goedert's regression model and putting in
15   the information for a state resembling the
16   United States as a whole. Do you recall that?
17 A Yes.
18 Q What are we supposed to take from that analysis?
19 A Again, it's essentially a critique of the argument
20   as applied to Wisconsin. Because the general
21   argument is that pro -- the argument is that there
22   is a pro-Democratic or pro-Republican
23   concentration or distribution of voters in
24   Wisconsin. And I am arguing that that's
25   incorrect.

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1 Q Now, I'll just say that the state -- hypothetical
2   state you were using -- and I'm on page 15 here --
3   was 13.2 percent black, African-Americans,
4   17.4 percent Hispanic, 80.7 percent urbanized, and
5   51 percent Democratic; is that correct?
6 A Correct.
7 Q And Wisconsin does not have those criteria, does
8   it?
9 A No.
10 Q And is there any seat in the country that has
11   these -- or any state in the country that meets
12   these demographic numbers?
13 A No.
14 Q They are the numbers for the country as a whole,
15   but each state is different in those regards; is
16   that correct?
17 A That's correct.
18 Q And then the congressional districts --
19   congressional elections take place on a
20   state-by-state and district-by-district basis?
21 A That's correct.
22 Q And is it your understanding that Goedert's model
23   does not apply to smaller states that are fewer --
24   that have like seven or fewer congressional seats?
25 A I think it's fewer than six, but I'm not sure.

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1 Q But it doesn't apply to a certain set of smaller
2   states that doesn't have enough congressional
3   districts?
4 A That's correct.
5 Q And do you know how many of the 435 congressional
6   seats come from states that aren't included in his
7   model?
8 A No.
9   MR. KEENAN: You know, we haven't
10   been going quite an hour, but we're moving
11   into the isolation and index, so I think it
12   might be a good time to just take a break.
13   MR. STRAUSS: That's fine.
14   (Recess)
15   MR. KEENAN: We're back on the
16   record.
17 By Mr. Keenan:
18 Q Mr. Mayer, we've talked a little bit before about
19   your measures of geographic concentration, so now
20   we're going to get to your report where you get
21   into those. And then on page 16 of your report,
22   why don't I just have you explain what
23   Global Moran's I is.
24 A Global Moran's I is a measure of spatial auto
25   correlation. It measures the degree to which the

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1   variants or the values that a variable takes in a
2   point in space correlates with values that that
3   variable takes in adjacent space. And it is
4   the -- a number which captures the average spatial
5   auto correlation at any unit of geography; in this
6   case the ward level.
7 Q Prior to your work on this case, had you been
8   aware of the Global Moran's I test?
9 A I was.
10 Q And had you ever performed a Global Moran's I
11   analysis on any geographic area?
12 A No.
13 Q And how were you aware of this particular measure
14   of concentration?
15 A Many years ago, I had done -- in my own research
16   done work on the geographic distribution of
17   defense contracts. And in the course of doing
18   that work, one of the issues that arises is
19   looking at different measures of spatial
20   association. So that's the first time that I had
21   come across it.
22 Q And prior to your work on this case, had you ever
23   seen it applied to any sort of analysis of
24   political partisans in a geographic area?
25 A Yes.

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1 Q What was that?
2 A That was the article on -- by Joey Chen and
3   Jonathan Rodden which they talk about -- it's
4   their automated redistricting program. And they
5   talk about Moran's I is an issue of -- a measure
6   of concentration or -- more properly it's a
7   measure of spatial association.
8 Q And then other than the Chen and Rodden article,
9   have you seen it applied to political partisans at
10   all?
11 A No.
12 Q Now to the time period of working on this case,
13   are there other instances now that you're aware of
14   where the Global Moran's I has been applied to
15   analyze political partisans?
16 A I've seen it used in studies of patterns of
17   campaign contributions which is analogous to
18   partisans. But again, it's a generalized measure
19   of spatial association that can apply to any
20   underlying measure.
21 Q And have you seen any analysis where
22   Global Moran's I scores are generated and then
23   used to determine how the spatial correlation
24   should translate into legislative seats?
25 A I think Chen and Rodden might have done that, but

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1   I would want to take the -- I'd want to take a
2   look at that article to be sure.
3 Q And other than that, have you ever seen anything
4   like that in the literature?
5 A Not that I can recall.
6 Q And then let's just focus on the Isolation Index
7   then. What is the Isolation Index?
8 A The Isolation Index is a measure of exposure, and
9   it measures the likelihood that a member of a
10   particular group will be exposed to other members
11   of that group in a particular geographic area. As
12   it is calculated, it is the weighted average of
13   the percentage of whatever group we are examining
14   in whatever subunit of geography or we are
15   examining on a larger aggregation. So in this
16   context it's the percentage of Democrats and
17   Republicans, the average percentage weighted by
18   population or the total population of Republicans
19   and Democrats.
20 Q Now I'll get into the specifics of how you did it
21   in this case for each of them. But just kind of
22   on a general level, prior to your work on this
23   case had you been aware of the Isolation Index?
24 A No.
25 Q How did you become aware of the Isolation Index?

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1 A I was sent an email by counsel suggesting that I
2   take a look at it.
3   MR. KEENAN: Why don't we just mark
4   this as 65.
5   (Exhibit No. 65 marked for
6   identification)
7 Q Could you identify what Exhibit 65 is?
8 A This is an email to me from Nick Stephanopolous
9   offering some sources that I might consult as I
10   did a spatial clustering analysis.
11 Q And you had previously mentioned an email from
12   counsel about possible sources. Is Exhibit 65 the
13   email that you were referring to?
14 A Yes, it is.
15 Q So I take it that on December 8th, 2015, was the
16   first time you had heard of the Isolation Index?
17 A I think that's correct.
18 Q And I also take it that because you first became
19   aware of this measure in this case, that prior to
20   your attention in this case you had never
21   performed an Isolation Index calculation before?
22 A That's correct.
23 Q Your report references -- I guess maybe I should
24   just ask you. What sources in academic literature
25   have used the Isolation Index to measure the

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1   segregation of political partisans?
2 A Sitting here, I can't think of any, but I would
3   say it doesn't matter because this is a
4   generalizable metric that can apply to any
5   population. It's used in a huge variety of
6   contexts that is not limited to demographics. So
7   my experience as a social scientist in the
8   literature review that I conducted led me to the
9   conclusion that this was a reliable method for
10   assessing the degree of concentration of
11   partisans.
12 Q And I note in your report on page 16 it says it
13   has been used to assess political geography by a
14   Glaeser and Ward article? I'm in the second to
15   last paragraph. It's the end of that paragraph.
16 A Let me look at that. So that's right. It was
17   used in that study. I was mistaken.
18 Q Although you were not aware of that study until
19   you were retained to work on this case; is that
20   correct?
21 A I think that's correct.
22   (Exhibit 66 marked for
23   identification)
24 Q I show you Exhibit 66 and then ask you to identify
25   it.

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1 A   This is the article, paper, "Myths and Realities
2   of American Political Geography."
3 Q   And this is the same document that's referenced on
4   page 16 of your report?
5 A   Yes.
6 Q   Who's Edward Glaeser?
7 A   I'm not personally familiar with him, but the
8   indication is that he is on the faculty at
9   Harvard. And NBER stands for National Bureau of
10   Economic Research.
11 Q   So you don't know whether he's a political
12   scientist or not?
13 A   I don't.
14 Q   And do you know if this article has been published
15   in any journal?
16 A   I do not.
17 Q   Do you know if it was peer-reviewed at all?
18 A   I do not.
19 Q   And I marked the exhibit. It's docket 593 which
20   was filed attached to a declaration you filed in
21   this case. Do you recall that?
22   MR. STRAUSS: I'm sorry, what's the
23   question?
24 Q   Do you recall filing a declaration in this case
25   with the court -- or an affidavit?

1 A   I probably filed several. I don't know what
2   specifically you're referring to.
3 Q   Okay. Do you recall filing one that was filed on
4   January 22, '16?
5 A   I don't remember.
6 Q   I guess we'll take this in pieces for
7   Global Moran's I. Why don't you explain how you
8   calculated that specifically in this case.
9 A   So there is a module in R that I think it was
10   developed by a political geographer. I think his
11   name was Roger Bevins. And it accepts as input a
12   shape file, allows the user to specify how it
13   calculates it, how it treats adjacent areas, and
14   then does the calculation.
15 Q   You say a shape file. What is that?
16 A   A shape file is a standard GIS, or geographic
17   information system, file that captures the spatial
18   attributes of a particular unit of geography and
19   also incorporates underlying data for that
20   geography.
21 Q   And then what was the specific shape file you put
22   into this R module?
23 A   It was a shape file of wards that was created by
24   the Legislative Technology Services Bureau of the
25   2012 wards. And I believe that I had attached my

1   own underlying partisan baseline data, although I
2   might have used the Republican -- I used the
3   presidential data, and that formed the inputs into
4   this.
5 Q   So there was an LTSB file that showed the
6   geographic location of each ward; is that correct?
7 A   Well, it doesn't show the location, but it's a
8   shape file that if you import it into a GIS
9   program, it will give you a map of the state and
10   show you the boundaries of each ward in the state.
11 Q   Okay. Sort of what I was thinking, but I phrased
12   it poorly, so thanks for the clarification.
13   And then obviously this analysis also
14   required knowing which wards were Democratic or
15   Republican; correct?
16 A   That's incorrect. It doesn't matter what --
17   whether a ward is Democratic or Republican. What
18   matters is the percentage of people in the ward
19   who are Democratic or Republican.
20 Q   It does require knowledge of that fact, though,
21   for each ward; correct?
22 A   Correct.
23 Q   And then how did you provide that information to
24   the R module?
25 A   So there's -- there are several commands. I'd

1   have to go back and look at the code that you
2   input the -- the first step is you tell R what the
3   shape file is that you're looking at. There's a
4   secondary command that tells R -- tells the
5   program how you want to treat the adjacent wards.
6   And it basically allows you -- the way that I did
7   it is specify that it was only the adjacent wards
8   that counted and specify that those wards had to
9   be more than point contiguous. They had to have a
10   shared boundary, that they couldn't just be -- you
11   know, if you had two squares that were connected
12   just at a vertex, that wouldn't count. They would
13   have to share a side. And so it measures the
14   spatial correlation for each ward with all of the
15   adjacent wards.
16 Q   And then how does the R program know that ward --
17   the relevant ward it's looking at is a ward with
18   more Democratic voters or more Republican voters?
19 A   It doesn't know. It uses -- the underlying data
20   in the shape file tell it how many Democratic
21   voters and how many Republican voters are in each
22   unit of geographic space.
23 Q   So in the shape file, what data was used to show
24   partisanship?
25 A   As I said, I think it was my partisan baseline,

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1   but I don't remember. It might have been the
2   actual presidential vote. I'm not sure.
3   Q   And for 2012, that would have been the 2012
4   presidential vote?
5   A   Correct.
6   Q   And then would that have been a two-party vote
7   share?
8   A   It would have been just the two parties.
9   Q   And then you also did analysis for the 2014
10   election. Do you know what the partisanship of
11   the ward, how that was determined for the 2014
12   analysis?
13 A   That, I used the gubernatorial election.
14 Q   And so that would be just the two-party vote share
15   for Walker and Burke in the 2014 governor's
16   election?
17 A   Correct. Although -- it wouldn't make any
18   difference if you used the share or the actual
19   numbers, so it is the vote share.
20 Q   And then you've talked about how then -- and just
21   to be clear, this is the first time you had run
22   this particular R module?
23 A   That's correct.
24 Q   And this is the module that's listed in footnote
25   11 on page 17 of your report?

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1   A   Yes. Spatial dependent -- yes.
2   Q   So I'm just trying to understand how then this
3   works. The R module looks at a ward, and then
4   what does it do about the neighboring wards?
5   A   So you're getting into the guts of the program.
6   The way that it works is that part of the
7   underlying data is both the boundaries of each
8   shape and the location of each shape. And so it
9   is able -- the underlying GIS data provides
10   information that essentially tells the programmer
11   or -- that the program uses to determine what are
12   the adjacent wards, what are the values of the
13   variable in the adjacent wards, and how the --
14   essentially how those values correlate, how
15   those -- how the variation in those values
16   correlate across the state. But I did not write
17   the program. I don't know specifically what the
18   precise steps are. But R is a universally used
19   open-source software program.
20 Q   And I'm just trying to understand, though, the
21   conceptual frame for how this is calculated -- so
22   like I have a ward X, and then the program of, you
23   know, 52 percent Republican, and then what is it
24   analyzing about the partisanship of the adjacent
25   wards?

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1   A   It's essentially analyzing the correlation of that
2   number with the percent Democratic and the
3   adjacent wards.
4   Q   And then is there a value created for each
5   individual ward?
6   A   There is.
7   Q   And then is that then -- what happens with, like,
8   each individual calculation? Is there an average?
9   A   It's an average.
10 Q   Okay. And so does -- I'm just looking at the
11   Table D on page 18. And so there's a call for
12   Democrats and Republicans. Did you have to run
13   separate analyses for each party?
14 A   Yes. Both the Global Moran's I and the
15   Isolation Index are asymmetrical, so you have to
16   run it for each individual group that you're
17   looking at.
18 Q   And every ward in Wisconsin would have fallen into
19   one of the buckets or the other?
20 A   Well, it's not a bucket because you run -- so you
21   run on the first pass, you're looking at the
22   Democratic concentration in each ward. Then you
23   run it again with the Republican concentration in
24   each ward.
25 Q   So every ward is analyzed under each analysis?

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1   A   Correct.
2   Q   So sorry if this is just basic stuff.
3   A   No, no.
4   Q   I'm not understanding. So like a ward that has
5   hypothetically 60 percent Democrat and then
6   40 percent Republican, on the Democratic side it
7   gets analyzed once, and then on the Republican
8   side that same ward also gets analyzed with its
9   neighbors?
10 A   Correct.
11 Q   And the neighbors are going to be the same in each
12   analysis; correct?
13 A   No.
14 Q   Aren't they just inverses of each other?
15 A   No.
16 Q   Why is that?
17 A   Because they don't -- you are looking at Democrats
18   to Democrats and Republicans to Republicans, and
19   those will not correlate perfectly.
20 Q   Now, if we're using just two-party vote share, I'm
21   trying to understand why that wouldn't quite work,
22   you know, if it's 60 percent on one hand and then
23   40 percent on the other.
24 A   I imagine because it's probably nonlinear. It's
25   doing it when you're at 60 and doing it when

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1   you're at 40 probably gives you different values,
2   although I haven't actually gone through and
3   worked through the math.
4 Q And so what does the -- looking at Table D, the
5   .75 for the Democrats in 2014, what does that
6   number mean?
7 A So that number is equivalent to a correlation
8   coefficient which ranges between zero to 1. A
9   number of zeros would mean that there is no auto
10   correlation, that there is basically no
11   relationship between being a Democrat in ward I
12   and being a Democrat in adjacent wards. So you
13   basically get random distribution. And as that
14   number goes towards one, it means that Democrats
15   and Republicans -- a Republican in ward I is
16   likely to live in a ward that is surrounded --
17   that is adjacent to other Republican wards. So as
18   that number goes towards one, it's a measure of
19   how likely a Republican ward or a Republican
20   living in a ward is likely to be living next to an
21   equivalent Republican ward. And because the
22   numbers are very similar, that is an indication
23   that Republicans and Democrats are distributed in
24   roughly equal measure as determined by the wards
25   compared to adjacent wards.

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1 Q And the correlation is that -- does that relate to
2   the strength of the partisanship of the ward?
3   It's not just that a Republican ward happens to be
4   next to another Republican ward? It's like a
5   75 percent Republican ward is next to a
6   74 percent?
7 A Correct. It's not even a measure of Republican
8   strength or Democratic strength. It's a measure
9   of how those values co-vary. So in a ward with
10   high Republican percentage, does that tend to
11   exist in areas where the adjacent wards are also
12   highly Republican? And as that is true, the
13   number will go towards one.
14 Q And you only did this for 2014 and 2012. Why did
15   you pick just those two years?
16 A Because I was not able to get shape files from --
17   I recall that I had difficulty finding the shape
18   files from 2008. I had a tougher time finding the
19   data.
20 Q Going backwards a little bit, we'll go to the
21   Isolation Index which is talked about on page 17.
22   How did you calculate the Isolation Index
23   specifically in this case?
24 A There is a -- it's a module. The nomenclature is
25   slightly different. In R they're just called R

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1   files. In Stata the command files are called ADO
2   files, .ADO. And the Isolation Index is
3   essentially a -- the formula is essentially how
4   likely a Republican in a ward -- so the
5   Isolation Index is nonspatial, so you don't need
6   to know where things are in space. All you need
7   to do is know what the values are in each record.
8   And it calculates the likelihood that a Republican
9   in a given ward lives -- the probability that a
10   Republican in a ward lives next to another
11   Republican or at the ward level.
12   So the Moran's I is a measure of spatial auto
13   correlation between wards. The Isolation Index is
14   a measure of geographic concentration within a
15   ward.
16 Q And you mentioned a Stata module. And I see is
17   that also listed on page 17, footnote 11 of your
18   report?
19 A Correct.
20 Q How did you become aware of that Stata module?
21 A Counsel made me aware of it.
22 Q And the R module, how did you become aware of the
23   R module that is used to calculate
24   Global Moran's I?
25 A I believe I found that myself. I'm not sure. I

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1   think I was able to find that. The R modules are
2   found in a general area that's open source. And
3   so you go there and you can search for -- I mean,
4   there are thousands and thousands of them.
5 Q   And then -- so getting back to the
6   Isolation Index, how did you do the -- how did you
7   do the Stata module? Like what data did you input
8   into it?
9 A So the Stata module just looks at the data, the
10   ward-level data on the number of Democrats and
11   Republicans. Again, I believe it was using a
12   baseline open-seat partisanship model. But I
13   might have used the -- no. So if you look at the
14   top of 17, just refreshing my memory, I used the
15   actual Assembly votes to get an accurate measure
16   of what actually happened.
17 Q So that applies to the prior testimony with the
18   Global Moran's I as well?
19 A Correct. I misspoke.
20 Q So actual Assembly votes for these -- in using --
21   for both of these, did you account for uncontested
22   races?
23 A No. I believe it was just the raw data.
24 Q Do you have any opinion on -- in some instances
25   you do make adjustments for uncontested races and

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1   adjusting the vote share to reflect what a
2   partisan candidate might expect to receive in that
3   district had it been contested. Do you have an
4   opinion on how not doing that for these clustering
5   analyses would have affected your numbers?
6 A I suspect they would actually be lower for both
7   Democrats and Republicans, but I'm not sure.
8 Q Because it would make wards in which there was an
9   uncontested race seem either more Republican or
10   more Democrat?
11 A Well, it would tend to drive -- when an
12   uncontested race goes to a contested race, it
13   drives both percentages towards 50 percent.
14 Q And then how does the Stata module then take those
15   Assembly votes in each ward and come up with an
16   Isolation Index?
17 A Well, the calculation is actually fairly simple.
18   It calculates the percentage for the Democrats.
19   It calculates the percentage Democrat --
20   Democratic vote in each ward and then weights that
21   quantity by that ward's percentage -- or the
22   fraction of the total Democratic population found
23   in that ward.
24   So the easiest way to describe it is it is
25   the weighted average of the Democratic vote

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1   percentage in each ward, and for the Republican
2   equivalent it's the weighted average of the
3   Republican vote in each ward.
4 Q And for these, is the vote percentage done across
5   all wards for both parties like it was done in the
6   Global Moran's, or are we just looking at over
7   50 percent Democratic wards?
8 A No. It's all wards.
9 Q And when you say "weighted average," I know that's
10   probably easy for you, but I'm trying to figure
11   out like how it's weighted. How is the share of
12   that ward's total vote figured into a weighting?
13 A Well, essentially it means that an individual
14   ward's contribution to the overall average is
15   going to be slightly larger -- slightly higher for
16   larger wards. So if you have 10 wards each with
17   equal population, each ward would count one-tenth.
18   But if you had one ward that was twice the
19   population, you would have nine wards making up
20   80 percent and then one larger ward would be
21   20 percent. So it's basically based on the
22   population. The larger the population, the more
23   an individual ward contributes to the average.
24 Q Is it weighted towards the total Assembly vote in
25   the state or the total Assembly vote for one

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1   party?
2 A Total Assembly vote for one party.
3 Q So the Democratic column is weighted towards the
4   total Democratic vote in the state and the
5   Republican column is weighted towards the total
6   Republican vote in the state?
7 A Correct.
8 Q And then you did that one back to -- from 2014 to
9   2004. Is there a reason you went back to 2004 as
10   your beginning point?
11 A Because the Isolation Index is a spatial, I don't
12   need any GIS. All I need is the ward-level
13   totals. I was able to do that farther back
14   because I didn't need the more complicated data.
15 Q Was that -- is 2004 as far back as the ward-level
16   data went?
17 A I don't -- I don't recall.
18 Q And then just to get kind of a -- for my
19   layperson's understanding, the .23 that's in the
20   2014 Dem-Rep column, first what does Dem-Rep stand
21   for?
22 A So the Isolation Index as I mentioned was a
23   spatial. So the first column is the isolation of
24   Democrats from Republicans. And then the second
25   column is the isolation of Republicans from

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1   Democrats. And again, you need to do it for
2   both -- both parties separately.
3 Q And so then the .23 number in the Dem-Rep column
4   for 2014, what does that mean?
5 A So that's the overall Isolation Index. And from
6   that I subtracted the statewide vote because other
7   things being equal in a state with more Democrats
8   or Republicans, the relative statewide
9   distribution is going to have an effect on the
10   Isolation Index. If you have a state with
11   90 percent Democrats and 10 percent Republicans,
12   that's going to exaggerate the extent of the
13   isolation of Democrats because there are more of
14   them; and the same thing for the Republicans. So
15   what I did is I subtracted the statewide vote
16   totals so that I could have a baseline that
17   controlled for the overall percentage. And this
18   is a -- the Isolation Index ranges from zero to
19   one.
20   Sorry, can we take a five-minute break?
21 Q Sure.
22   (Recess)
23 By Mr. Keenan:
24 Q We're back on the record after a short break, and
25   we were talking about Table C, the

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1   **Isolation Index. And you had -- you were**
2   **explaining how you had subtracted out a statewide**
3   **vote total to get to the number here. And so**
4   **maybe just building on that, before subtracting**
5   **out the statewide vote total, what type of number**
6   **were you getting? What was that showing?**
7 A My recollection is that those numbers tended to be
8   in the -- in the 65 to 75 percent range. Again,
9   you know, indicating that Democrats and
10   Republicans are concentrated in roughly equal
11   measure on a statewide basis. But I don't
12   remember what they are off the top of my head.
13 Q **And then that would be -- before subtracting any**
14   **state vote total, it would be that a particular**
15   **ward was -- it would be like the weighted average**
16   **Democratic ward was 65 percent? I'm trying to**
17   **figure out what that is.**
18 A Sorry. This is a technique that the census uses
19   again to control for the fact that populations
20   comprise different shares -- or different
21   population groups, subgroups comprise different
22   shares of the population. So it's a way of
23   controlling for the fact that when you have more
24   members of a group, you're going to see, all other
25   things being equal, higher population isolation

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1   in a way that doesn't redound to the advantage of
2   each party. You know, in 2012 the Democratic
3   isolation is marginally higher than the Republican
4   population. But in 2010, which was an
5   overwhelmingly Republican year, the Republican
6   isolation was marginally higher than the
7   Democratic population. So it's just a way of
8   accounting for these differences in the statewide
9   vote or the statewide composition that each group
10   makes.
11 Q **And so -- so the vote share you subtracted, was**
12   **that that party's vote share for the --**
13 A Correct.
14 Q **So the Dem-Rep column there was a number and then**
15   **there was a subtraction of the Democratic vote**
16   **share?**
17 A Right. So if you take 2010 where I believe the
18   Republicans got 52 percent of the statewide vote,
19   that would show that the Republican isolation was
20   69 and the Democratic isolation was 62. So -- it
21   will tend to -- but again that's because there
22   were more Republicans than Democrats, you control
23   for that. It tends to be a more comparable
24   measure across time.
25 Q **And where did you get the vote share information**

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1   **that you were using to adjust the number?**
2 A I believe I just added up the vote share data in
3   the individual wards.
4 Q **Okay. So if the -- the actual Assembly vote share**
5   **based on your ward data?**
6 A I believe so.
7 Q **So it wasn't Professor Jackman's numbers which are**
8   **adjusted for uncontested seats?**
9 A I don't believe so.   Oh, it definitely would not
10   be, because as a statewide number -- it was the
11   statewide number.
12 Q **And then -- and you were using the percent. So**
13   **like 52 percent you'd subtract .52; is that how it**
14   **worked?**
15 A Correct.
16 Q **And then going back to this .23 now after the**
17   **adjustment, what is that .23 telling us about the**
18   **average Democratic --**
19 A My interpretation is that the -- an average
20   Democrat, sort of a typical Democrat lives in a
21   ward that is 23 percent more Democratic than the
22   state. And a typical Republican lives in a ward
23   that is 20 percent more Republican than the state.
24 Q **When you say average Democrat or average**
25   **Republican, this calculation is actually a**

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1   **calculation about each ward; is that correct?**
2 A There are different parts of that question.
3 Q **Sure.**
4 A Can you break them out?
5 Q **So I'm wondering how you can say it's a typical**
6   **Democrat or typical Republican lives in a ward.**
7 A So maybe this is the way to phrase it. On a
8   statewide basis, on average a Democrat will live
9   in a ward that is 23 percent more Democratic than
10   the state, on average. So don't think of it in
11   terms of a notional typical Republican, but on a
12   statewide basis any Republican -- an average
13   Republican will live in a ward that is 20 percent
14   more Republican than the state as a whole. So
15   it's not as if we are looking at sort of a
16   demographically typical Republican or Democrat and
17   figuring out. That's just sort of looking at the
18   state as a whole.
19 Q **Okay. And then if we can just move to the next**
20   **section, we can go a little bit on that and then**
21   **we'll take a break for lunch. So this is**
22   **Roman III. Did you understand Trende was claiming**
23   **that your vote model was biased?**
24 A I did. That was my reading of his criticism.
25 Q **You didn't understand that he was saying that**

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1   Jackman's model might be biased based on the
2   numbers generated from your model?
3 A I couldn't say anything about his criticism of
4   Professor Jackman's model.
5   MR. KEENAN: Why don't we stop
6   there.
7   THE WITNESS: Okay.
8   (Recess for lunch)
9   By Mr. Keenan:
10 Q We're back from lunch, Mr. Mayer, and we are -- go
11   back to your report now to section Roman
12   Numeral V. It's on page 22. And this is a
13   discussion to Gaddie's Act 43 district-level
14   estimates. We went over this in your last
15   deposition, but just to refresh your memory that
16   you relied on a table that had some percentages
17   for each of the Assembly districts in terms of
18   their Republican vote percentage. Do you recall
19   that?
20 A Yes.
21 Q   And you've referred to that as the Gaddie
22   percentages?
23 A Correct.
24 Q Okay. And you've assumed that those percentages
25   were generated using a regression model created by

1   Professor Keith Gaddie?
2 A Not necessarily.
3 Q   Okay.
4 A   Because Gaddie in his deposition used two
5   equivalent methods. One of them was a regression
6   method. Another was a combination of races which
7   he regarded as equivalent but much easier to
8   calculate.
9 Q And would it change any of your opinions if the
10   numbers that were -- that you used for the Gaddie
11   Act 43 district estimates were calculated using an
12   average of all statewide races from 2004 to 2010
13   rather than a regression model?
14 A I'm not sure what the exact composition was, but
15   it was some combination of statewide races and
16   previous election cycles.
17 Q   But in your report here you reference in
18   deposition testimony from Professor Gaddie, in the
19   Baldus deposition, that with -- assuming all seats
20   were contested, no incumbents would run. Do you
21   see that?
22 A Are you referring to that block quote from
23   Professor Gaddie's deposition? Yes.
24 Q And that was Professor Gaddie's deposition in the
25   previous case, the Baldus case; correct?

1 A Yes.
2 Q Do you know whether the Act 43 district-level
3   estimates that you've characterized as Gaddie's
4   Act 43 estimates are actually generated from the
5   regression model that's described in this quote on
6   page 22 of your report?
7 A I don't.
8 Q Going to page 23 and then on to 24, there's a
9   statement that says in the very last sentence on
10   page 23 that continues on to 24, it says, "Either
11   way, the same conclusion would follow that the map
12   is an extreme Republican gerrymander and that the
13   authors of Act 43 had information in their
14   possession that predicted it."
15   What evidence do you have that the map is an
16   extreme Republican gerrymander?
17 A That's based on the size of the efficiency gap and
18   also the factual record of the -- of what the
19   individuals who drew the map did in the process,
20   the sequence that they went through.
21 Q And we had some testimony earlier this morning on
22   that, so you're referencing back to that earlier
23   testimony?
24 A Correct.
25 Q And then it's also just the size of the efficiency

1   gap seen in the first two elections?
2 A And also the examples that I found in analyzing
3   Act 43 with packing and cracking.
4 Q   And those are in your initial report?
5 A Correct.
6 Q In this report you take incumbency into account?
7 A I'm sorry, I was coughing.
8 Q In your rebuttal report you take incumbency into
9   account, whereas you had not done that in your
10   initial report. What's your opinion as to whether
11   in evaluating a districting plan people should
12   consider incumbency?
13 A In the political science literature the most
14   common method is to use a baseline method which
15   assumes no incumbents and that all races are
16   contested. Because this gives you the best
17   opportunity to evaluate alternative hypothetical
18   plans, where you don't necessarily know where the
19   incumbents are. And so that's the technique that
20   I used.
21   So the reason I reran the analysis with
22   incumbency is in response to the criticism that
23   Goedert leveled at the fact that I didn't do that
24   demonstrated that my methods were unreliable, and
25   that in the absence of that, taking incumbency

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1   into effect, that my analysis could not be
2   trusted. I think that's incorrect.
3   But in response to that, I thought it was
4   prudent to go ahead and do the analysis with
5   incumbency, which demonstrates that even though
6   the efficiency gap changes, it does not have a
7   material effect on whether it's above or below the
8   threshold. Under Act 43, the efficiency gap
9   remains very large. Under the demonstration plan,
10   the efficiency gap remains very low, even when you
11   take incumbency into effect.
12 Q You've talked about using a baseline percentage
13   that has no incumbents in a district that's
14   contested, and you only used one set of election
15   results to calculate the baselines, correct, for
16   Act 43 in the demonstration plan?
17 A That's correct.
18 Q Would it be more accurate to take several
19   different election results and then create
20   partisan baselines?
21 A Not necessarily. The fact that Professor Gaddie
22   and I used different methods and came up with what
23   amount to the same answer suggests that it
24   wouldn't have made any difference. And the
25   predictive value of my model was so high that

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1   there was probably nothing that could be added
2   that would make it even more -- make it even more
3   accurate.
4   Q But what was the -- did you do an analysis of the
5   predictive power of what you're referring to as
6   the Gaddie model or your own model on the 2014
7   elections?
8   A I'm sorry? Could you say that again?
9   Q Yes. Did you do an analysis of the predictive
10   power of the Gaddie model on the 2014 elections,
11   how well it did predicting those?
12 A I did not.
13 Q Now, if the 2014 elections had occurred first
14   instead of the 2012 elections, would the
15   correlation have been different? Or I'm sorry,
16   the correlation between the Gaddie model in the
17   2012 election is different than the correlation
18   between the Gaddie model and the 2014 election,
19   wouldn't it be?
20 A Without looking at it, I don't know.
21 Q And Republicans won 63 seats in the 2014 election;
22   is that correct?
23 A I don't know.
24 Q All right. So I'm looking at Table E here, and it
25   shows that the demonstration plan based on

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1   efficiency gap is 2.2 percent; correct?
2   A Correct.
3   Q And then you look at -- then when you factored in
4   incumbency you come to a 3.71 percent efficiency
5   gap; is that correct?
6   A That's correct.
7   Q So the effective incumbency increased the
8   efficiency gap by 1.5 percent; correct?
9   A 1.51 percentage points.
10 Q Yes. And your 3.71 percent gap is over half the
11   way to the 7 percent unconstitutional threshold?
12 A That's correct.
13 Q And looking at Act 43, the efficiency gap goes
14   from 11.69 to 13.04; is that correct?
15 A That's correct.
16 Q So that the efficiency gap caused a jump of 1.35
17   is it?
18   MR. STRAUSS: Object to the form.
19   You said the efficiency gap. You mean the
20   adding incumbency, I think.
21 Q So Act 43, the baseline is 11.69; do you see that?
22 A Yes.
23 Q And then adding an incumbency we get to 13.04; do
24   you see that?
25 A Yes.

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1   Q So adding that incumbency, factoring an incumbency
2   added 1.35 to the efficiency gap?
3   A That's correct.
4   Q And you say it doesn't make a difference in this
5   case because both numbers are over the threshold;
6   is that correct?
7   A It's not a material difference.
8   Q Okay. But what if a plan -- it did make a
9   difference, which one do you think should be
10   considered? Like on one of them it was at 6.5.
11   Then it was at 8.
12 A I think it would depend on what you were trying to
13   do. As I mentioned in my earlier deposition, the
14   reason I did a baseline is that it is a crucial
15   piece of information to know what the baseline
16   partisanship was. And that's what you do in
17   advance, which is what Professor Gaddie did before
18   you know who the incumbents are, what the
19   districts actually are. I would -- and the reason
20   I did it that way is that I was trying to make a
21   direct comparison between the actual districts in
22   Act 43 and the hypothetical districts in the
23   demonstration plan where the effect of incumbency
24   would be rearranged because the district
25   boundaries are different. And so that's a direct

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1 point of comparison. And that's a vital piece of
2 information.
3   Putting incumbency in as I demonstrated here
4 is another piece of information once an election
5 is actually -- putting an incumbency back in, that
6 effect back in is another piece of information,
7 but it did not change the results.
8 Q In this case, but in some cases it might, wouldn't
9   it?
10 A It's possible.
11 Q And then what should a court look at in that
12   instance, which number?
13 A You know, you're asking a hypothetical, and I
14   would have to actually look at the situation to
15   make a determination.
16 Q And so in looking at -- further down on page 24,
17   you say that in 2012 there were 50 Republican
18   incumbents running and then 24 Democratic
19   incumbents; is that correct?
20 A Where are you?
21 Q Very last part of page 24 underneath the table but
22   before the footnote.
23 A Correct. I see.
24 Q And that's based on the -- what actually happened
25   in the 2012 elections? The incumbents that

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1   actually chose to run for re-election?
2 A That is correct.
3 Q And in calculating -- in trying to account for
4   incumbency under Act 43, what did you do with
5   respect to those 74 incumbents?
6 A I was provided by counsel a list of addresses for
7   every incumbent and their political party. I
8   geocoded that, which means that I used an
9   application that transforms an address -- a street
10   address into a geographic coordinate of latitude
11   and longitude, which then can be loaded into a GIS
12   system, and that gives me the physical location of
13   a -- of that address and that incumbent on the --
14   on a map. With that information and using the
15   boundaries of demonstration plan, I was able to
16   identify districts that had an incumbent. And I
17   assigned the value of incumbency based on the rule
18   that if there was no incumbent it was an open
19   seat. If there was a Republican and Democratic
20   incumbent, it was an open seat, which is how this
21   is handled in the literature because the
22   incumbency advantage cancels out.
23 Q I'll just stop you. So if there was a match-up
24   between two incumbents of different parties,
25   that's treated as open?

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1 A That's correct. And in a situation where you had
2   multiple members of one party in a seat, I counted
3   that as the incumbent for that party. And that's
4   standard how this is treated in the discipline.
5   And then for Act 43 I actually had the -- I
6   knew who the incumbents were. I knew what
7   districts they ran in, so I didn't need to geocode
8   their addresses.
9 Q Sure. So if I understand it correctly, under both
10   Act 43 and the demonstration plan, to the extent
11   the seat was characterized as open, either because
12   there was no incumbent at all or there was a
13   match-up between incumbents of opposite party,
14   there should have been no change from your
15   open-seat baseline model?
16 A I believe that's correct.
17 Q Okay. And just -- maybe just to make sure we're
18   on the same page, if a district had no incumbent
19   on your demonstration plan, the vote total should
20   have remained the same because there was no need
21   to adjust for incumbency?
22 A That's correct.
23 Q And Act 43 the same thing as well; that if there
24   was no incumbent, the partisan baseline would just
25   have carried over from previously; is that

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1   correct?
2 A That's correct.
3 Q I have this computer here because I'm going to be
4   providing some printouts of Excel spreadsheets
5   that were produced to me by counsel that you
6   provided to them. To the extent that you want to
7   look at an original one, I have that on here. You
8   don't need to if you don't want to, but if you
9   want to, let me know and I can move the computer
10   over and you can look at the spreadsheet.
11   Sometimes they're harder to see in person.
12
13   MR. KEENAN: I'm marking different
14   tabs of the same spreadsheet files, so I'm
15   wondering should we mark them different
16   exhibit numbers or do them like 67-A, 67-B
17   sort of thing.
18   MR. STRAUSS: Your choice.
19   MR. KEENAN: Let's just do separate
20   numbers then.
21   (Exhibit No. 67 marked for
22   identification)
23 Q I'll hand you Exhibit 67, and I will inform you
24   that this is taken from a file produced to me
25   that's called Efficiency Gap -- Incumbencies in my

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1   Plan. It's an Excel spreadsheet file. This is
2   from a tab that the title at the top of the first
3   page says Act 43. That's the tab of the
4   spreadsheet. Do you recognize this document?
5 A Can I look at it --
6 Q Sure.
7 A I just want to make sure. Okay.
8 Q So do you recognize what this document is?
9 A Yes.
10 Q And what is this document?
11 A This is a document that -- or this is a
12   spreadsheet or a worksheet that shows for each
13   Assembly District the predicted values of the
14   Democratic and Republican Assembly vote for all of
15   the different possible permutations where the seat
16   is open, where the seat has a Democratic incumbent
17   and where the seat has a Republican incumbent.
18   And then the last two columns, J and K -- actually
19   let me continue to describe this. Column A is the
20   district number. Column B records the party of
21   the incumbent, R for Republican, D for Democrat, O
22   for open seat. And then the last two columns, J
23   and K, take from the previous values the
24   appropriate value of the vote prediction based on
25   whether it was open, a Democratic incumbent, or a

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1   Republican incumbent. And that gives you the
2   forecast of the result of my baseline estimate
3   once you factor in incumbency.
4 Q So looking at District 1, it's in Column B, the
5   incumbent column, it has an R there. Does that
6   mean there's a Republican incumbent in that
7   district?
8 A Yes.
9 Q And then I see on District 7 there's an O in
10   Column B. Does that mean it's an open seat?
11 A That's correct.
12 Q And then I guess down another one, District 8
13   there's a D in the incumbent column. Does that
14   mean a Democratic incumbent was in that seat?
15 A That's correct.
16 Q I guess if we add all these up, we should have 50
17   Republican incumbents and then 24 Democratic
18   incumbents?
19 A I imagine that's true.
20 Q And just to be clear, because there's an R
21   incumbent, the vote total when taking incumbency
22   into account would be the column that says --
23   Column H, R-Rinc; is that correct?
24 A I'm sorry, say that again.
25 Q Sure. In District 1 there's a Republican

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1   incumbent, so would a correct vote total when
2   you're trying to take incumbency into account be
3   Column H which is R-Rinc?
4 A That's correct.
5 Q And then the Democratic vote in that instance
6   would then be the column F, D-Rinc; is that
7   correct?
8 A That's correct.
9 Q That stands for like a Democrat in an incumbent
10   district?
11 A Exactly.
12 Q And then we go to open seat. The vote totals
13   would be the R open and the D open; correct?
14 A Correct.
15 Q And then a Democrat seat like District 8 would be
16   -- the Democratic vote total would be column E,
17   D-Dinc; is that correct?
18 A That's correct.
19 Q And then the Republican vote would be the R-Dinc,
20   Column G?
21 A Correct.
22 Q Okay. And then I guess we'll get to another
23   document that does this more fully.
24   The columns J and K would be the Act 43 vote
25   totals taking incumbency into account?

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1 A The predicted Act 43 vote totals taking incumbency
2   into account.
3 Q Sure. Based on your model?
4 A That's correct.
5 Q And then you might keep that handy to the extent
6   we need to refer you.
7   MR. KEENAN: I will now mark this
8   one as 68.
9   (Exhibit No. 68 marked for
10   identification)
11 Q I'll hand this to you. And this is another tab of
12   this same spreadsheet we've been looking at, a tab
13   that's titled, as it says at the top of the
14   document, Inc Calcs My Plan. And you can look at
15   it on the machine as well.
16 A Okay.
17 Q Could you explain what this document is.
18 A This is a spreadsheet that does the equivalent
19   calculation for the demonstration plan based on
20   the baseline partisan predictions which assumes,
21   as does the Act 43 calculation, that all races are
22   contested. This, for the designation of the
23   incumbent status of the race, uses the geocoded
24   address of the incumbents with incumbency
25   determined as I mentioned earlier. So it

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1   replicates the predicted vote -- the predictive
2   vote totals under the demonstration plan taking
3   incumbency into effect.
4 Q   And then we see some of the same headings in the
5   Columns A, B, C, D, E, F, G, and H. Do the values
6   in Exhibit 68, are those columns the same as they
7   were in Exhibit 67?
8 A   So are these values the same?
9 Q   I'm sorry. That was a bad word. Not the values
10   but what the categories, like what the column is
11   representing. R-open, does that also mean a
12   Republican open seat like it did in the prior
13   spreadsheet we looked at?
14 A   That's correct.
15 Q   And so like the incumbent column, an R means a
16   Republican incumbent is in that district?
17 A   That -- well, that value is the predicted vote
18   total if the incumbent is in that district or if
19   that district has a Republican incumbent.
20 Q   I'm sorry, I may have been -- just look at
21   Column B, it says incumbent and then there's an R
22   in District 1. Does that mean that your geocoding
23   analysis shows that a Republican incumbent would
24   be in your demonstration plan Exhibit 1 or
25   District 1?

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1 A   That's correct.
2 Q   And so the same with District 2, there's an R
3   there, so that shows that a Republican incumbent
4   would have been in your demonstration plan
5   Exhibit 2 -- or District 2?
6 A   That's correct.
7 Q   And going through the Os would also represent an
8   open seat like they did before; is that correct?
9 A   That's correct.
10 Q   And then a D would represent a Democratic
11   incumbent is located in the relevant demonstration
12   plan district?
13 A   That's correct.
14 Q   I saw on Districts 49 and 50, it's on page 2,
15   there's a Y in that column. Do you know what that
16   means?
17 A   So based on the predicted Democratic and
18   Republican vote, that is recorded as an open seat.
19   That may have been one of the areas where you had
20   an odd combination. So if it was two Republicans
21   and two Democrats, it's an open seat. This may
22   have been a case where you had three incumbent,
23   three Republicans and two Democrats or two
24   Democrats and one Republican. So I believe I
25   counted that as an open seat. But I wanted to

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1   designate that so if I had to, I'd go back and
2   check that.
3 Q   Okay. And then if we go up -- if we just would
4   add all the Rs in column B, that would show how
5   many Republican incumbents under the demonstration
6   plan would be running in a district for
7   re-election?
8 A   Not precisely. That wouldn't count the number of
9   incumbents. It would count the number of
10   districts that were coded as Republican incumbents
11   because remember you could have districts with
12   more than one incumbent. So that wouldn't -- the
13   number of Rs and Ds would not necessarily
14   translate into the actual number of Republican and
15   Democratic incumbents who ran under Act 43.
16 Q   Do you know how many under your demonstration
17   plan -- how many Republican Assemblymen incumbents
18   were districted together in the same district?
19 A   Not off the top of my head.
20 Q   Is there a way -- is there a document that shows
21   that?
22 A   It would probably be on the actual GIS files on my
23   desktop. I never did produce a written document
24   with that.
25 Q   And then do you know how many match-ups of

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1   Republican and Democratic incumbents your plan
2   resulted in?
3 A   I don't recall sitting here.
4 Q   Or how many Democratic incumbents were districted
5   out of their prior district?
6 A   I don't know sitting here.
7 Q   And that wasn't something that you considered when
8   you were drawing the demonstration plan initially?
9 A   That's correct, I did not.
10 Q   So in looking at Exhibit 68 to determine the vote
11   totals under your plan, taking incumbency into
12   account, if there is a -- in Column B, if Column B
13   represents an R for Republican incumbent, then the
14   Republican vote share should be the R-Rinc total;
15   is that correct?
16 A   That's correct.
17 Q   And then the Democratic vote in that district
18   would be the D-Rinc column; is that correct?
19 A   That's correct.
20 Q   And then for an open seat it would be the R open
21   and D open vote totals; is that correct?
22 A   That's correct.
23 Q   And those numbers shouldn't change from your
24   open-seat baseline from your initial report; is
25   that correct?

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1 A They shouldn't.
2 Q And then a D, if there's a D in the incumbent
3   column, the Democratic vote total would be the
4   D-Dinc column; is that correct?
5 A That's correct.
6 Q And then the Republican vote total in that
7   district would be the R-Dinc column; is that
8   correct?
9 A That's correct.
10   (Exhibit No. 69 marked for
11   identification)
12 Q I'll give you Exhibit 69. This is a printout of
13   another tab in the same Excel spreadsheet we've
14   been looking at which was -- as shown at the top
15   it's labeled EG Act 43 With INC?
16 A Okay. So this is from the -- this is just a
17   different tab.
18 Q A different tab with a title that's on the top
19   here. So I take it this relates to Act 43;
20   correct?
21 A Correct.
22 Q And then why don't you explain what this document
23   is?
24 A This is a spreadsheet template that I used to
25   calculate the efficiency gap. It has the

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1   districts, the population, the predicted votes
2   from my model, and then the calculations of the
3   lost and surplus Democratic and Republican votes,
4   which go into calculating the efficiency gap.
5 Q And if you could pull up Exhibit 67 as well to
6   look in conjunction with this. If I understand it
7   correctly, if you look at Exhibit 67 it shows
8   District 1 was a Republican incumbent, and
9   therefore the vote total is, Column H, 16,908; is
10   that correct?
11 A That's correct.
12 Q And so then we look at Exhibit 69. It shows
13   predicted Republican vote in Column H of 16,908.
14   Do you see that?
15 A I do.
16 Q So should the numbers on Exhibit 69 match up with
17   the numbers on Exhibit 67 when you look at the
18   predicted Dem and predicted Republican votes?
19 A They should.
20 Q Now if we go to the last page of this.
21   MR. STRAUSS: Which, Exhibit 69?
22   MR. KEENAN: Yes, Exhibit 69.
23   Sorry.
24 Q It shows Republicans winning 60 total seats; is
25   that correct? Down on the bottom.

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1 A That's correct.
2 Q And I see a number in Column P, the very bottom,
3   it says 14.1422 percent. Do you see that?
4 A Yes.
5 Q Is that the efficiency gap of Act 43 with
6   incumbents?
7 A I'm not sure. I'd have to look at what that
8   number refers to.
9 Q Well, I'll give you the time to look because in
10   your report it says that the efficiency gap for
11   Act 43 with incumbents taken into account is 13.04
12   and this shows 14.14, so I'm wondering what the
13   discrepancy is.
14 A Now, I'm not sure what's going on here. The
15   actual table that has the efficiency gap
16   calculations is in a different file.
17 Q And if you can find that file, I'd -- I didn't see
18   one in the production that had a spreadsheet with
19   Act 43 calculations.
20 A Okay. Can you bring up the directory?
21 Q So Mayer production 2, correct, is what was --
22   that's how we saved the corrected production that
23   was made to us, and then these are the folders
24   that were given to us.
25 A I don't know why that number is different. It

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1   could just be a typo. I would have to -- because
2   that's the correct formula. But that's an error.
3   Actually, it's an error in your favor.
4 Q And then a question on Exhibit 69, just
5   technically how -- there's listed predicted Dem
6   votes and then predicted Republican votes, and
7   that number will change depending on whether
8   there's an incumbent or not. How did you get the
9   number that's listed in Column F or Column H? Was
10   it manually input, or did you have some sort of
11   automatic way of populating those fields?
12 A My recollection is that I did it as a
13   copy-and-paste with the districts sorted.
14 Q Would that have been a copy-and-paste from
15   Exhibit 67?
16 A It's possible.
17   MR. KEENAN: We'll mark this next
18   one as Exhibit 70.
19   (Exhibit No. 70 marked for
20   identification)
21 Q I'll put that before you. And this is yet another
22   tab from the same spreadsheet titled, as reflected
23   on the top, EG with INC. And I think it might be
24   helpful to look at this one in conjunction with
25   Exhibit 68. Can you identify what Exhibit 70 is?

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1 A   This is the -- looks like the template for
2   calculating the efficiency gap with what looks to
3   be the demonstration plan, but I can't be certain
4   because it does not say.
5 Q   And feel free to look at the spreadsheet, and I
6   was going to compare numbers in Exhibit 68 with
7   Exhibit 70.
8 A   Okay.
9 Q   And if you look at, for example, District 1 on
10   Exhibit 68 shows there's a Republican incumbent,
11   that the Democratic vote with a Republican
12   incumbent Column F should be 15,632.83, and
13   Column J says D vote 15,632.83. And then if we
14   look at Exhibit 70, Column F, predicted Dem it
15   says 15,632.8269. Do you see that?
16 A   Yes.
17 Q   Okay. And then looking down at District 2, I see
18   it also matches up with the D-Rinc, Column F,
19   11,254.58. Do you see that?
20 A   Yes.
21 Q   So does Exhibit 70 represent the predicted vote
22   totals under the demonstration plan taking
23   incumbency into account?
24 A   It should.
25 Q   And then it also contains a list, as we've seen in

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1   some other spreadsheets, of the wasted votes. And
2   then we look at the bottom at the very last page,
3   it has total numbers of wasted votes across all
4   districts. Do you see that?
5 A   Yes.
6 Q   And here I believe it indicates that there's an
7   efficiency gap of 3.8855 percent; is that correct?
8 A   That's correct.
9 Q   In your report it says that the efficiency gap
10   with incumbency taken into account is
11   3.71 percent, I believe. Do you know why there's
12   a discrepancy?
13 A   Sitting here, I don't.
14 Q   And looking at -- here's a Column Q that says "Rep
15   win." I take it that means Republican win?
16 A   Uh-huh.
17 Q   And at the bottom totaling them all up it shows
18   50 Republican wins. Do you see that?
19 A   Yes.
20 Q   So does that show that taking incumbents into
21   account under the demonstration plan, the
22   Republicans would be expected to win 50 of the 99
23   seats in the Wisconsin Assembly?
24 A   That's correct.
25 Q   Now, you also did some uniform swing calculations;

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1   is that correct?
2 A   I did.
3 Q   And you did that to both the demonstration plan
4   and Act 43; right?
5 A   That's correct.
6 Q   Could you explain how you performed a uniform
7   swing?
8 A   So the way that a uniform swing is done is that
9   you subtract or add a constant vote share change
10   to each district in a plan. So D minus 5 would be
11   looking at the percent Democratic vote in each
12   district and subtract -- it's actually to get it
13   right you don't subtract 5 percent. You subtract
14   2 and a half percent because you're subtracting
15   and increasing the other side, which amounts to a
16   5 percent swing. And then you look at the results
17   and you can -- it's a standard technique that
18   allows you to examine the effects of a plan in a
19   variety of different electoral settings.
20 Q   Now, in your model -- in looking at your model,
21   did you swing the vote totals, or did you swing
22   the two-party vote percentage?
23 A   In doing the calculations I swung the vote totals.
24 Q   And did you swing the total Assembly vote, or did
25   you swing the input that generated that, like the

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1   presidential vote total?
2 A   No. I applied the constant to the predicted vote
3   totals.
4 Q   So maybe we could just look at Exhibit 70 was the
5   last one we were looking at. We could get a sense
6   of this like District 2 maybe has D, predicted Dem
7   vote of 11,255, rounding to the nearest whole
8   number. Do you see that?
9 A   Say that again.
10 Q   Yes. District 2 I'm looking at.
11 A   Uh-huh.
12 Q   Has a Column F, predicted Dem vote, 11,254, which
13   I guess we'd arrive to 255 to the nearest whole
14   number?
15 A   That's correct.
16 Q   And that equals 51.8 percent of the two-party
17   vote; is that correct?
18 A   Correct.
19 Q   Then there's a corresponding Republican vote share
20   of 10,457 rounding to the nearest whole number.
21   Do you see that?
22 A   Right.
23 Q   And that's 40.2 percent of the two-party vote?
24 A   Correct.
25 Q   A uniform swing of minus 5 percent, how would

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1   those numbers change?
2 A   A uniform swing of 5 percent, that would turn into
3   a Republican district.
4 Q   And how did you -- what would the Dem vote total
5   be? And I guess I don't need you to actually give
6   me a number, but how would you modify the number
7   that's in Column F to get to the new number?
8 A   I would want to look at the spreadsheet I used to
9   do those calculations. I believe I subtracted
10   just a percentage from the vote totals.
11 Q   Okay. And then would the two-party vote shares,
12   would you be able to just subtract 5 from 51.8 and
13   that would end up being the new two-party vote
14   share?
15 A   I'd have to look at the calculation because I
16   think algebraically it's a little different. You
17   don't swing that up or down by 5 percentage points
18   because the math -- I think you swing it up or
19   down by -- because we're dealing with vote totals
20   instead of vote percentages. To get the
21   percentages right, you have to change the vote
22   totals by half that, which actually gets you to
23   the plus or minus 5. Because if we were applying
24   the swing analysis just to the vote percentage,
25   you could do it. But when you're looking at the

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1   raw numbers, I think you have to add and subtract
2   half of the swing.
3 Q   I'll open up another spreadsheet here which is the
4   swing ratio report calculations. You can look at
5   that, but I'm going to go to some spreadsheets
6   from that document, which I believe is your swing
7   ratio document you were referring to.
8   (Exhibit No. 71 marked for
9   identification)
10 Q   I set before you what's been marked as Exhibit 71,
11   which is a tab, and I believe it's the leftward
12   most tab on the spreadsheet we were looking at
13   called Incumbents.
14 A   Okay.
15 Q   And can you identify what this document is?
16 A   This looks like it is a set of efficiency gap
17   calculations for what appears to be the
18   demonstration plan.
19 Q   Then if we go to the last page, in Column T it
20   shows an efficiency gap of 3.71. Do you see that?
21 A   I do.
22 Q   And that matches up with what's in your report?
23 A   It does.
24 Q   And so -- and if we look at the other tabs on the
25   spreadsheet there, I think there's one called

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1   minus 5 and plus 3. Do you see that?
2 A   Yes.
3 Q   So are those -- does Exhibit 71 provide the
4   baseline from which you performed uniform swings
5   of minus 5 and plus 3?
6 A   That's correct.
7 Q   Now, should Exhibit 71 contain the same numbers
8   that we saw in Exhibit 70, which was your
9   efficiency gap calculation for the demonstration
10   plan with incumbents?
11 A   So I'm going to say no. Because I think what
12   occurred here is that the Exhibit 70 is an earlier
13   version that I would have to go back and check.
14   But I must have made some corrections to that.
15   And I don't know why that was included. But what
16   was -- the report used this number. Then this is
17   the accurate number. And this must have been a
18   preliminary version for one reason or another. I
19   don't know why.
20 Q   So if we look at Exhibit 71, it shows -- what does
21   the Column J predicted Dem mean?
22 A   That is the forecast number of Democratic votes in
23   the demonstration plan district with incumbency
24   taken into effect.
25 Q   And what does the predicted Rep Column L mean?

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1 A   It's the same value for the predicted Republican
2   vote in the demonstration plan Assembly District
3   after taking incumbency into effect.
4 Q   If we look at District 2, I see the predicted Dem
5   vote in Column J is 12,899. Do you see that?
6 A   So we're looking at Assembly District 2?
7 Q   Yes.
8 A   The predicted Democratic vote.
9 Q   Is 12,899?
10 A   Yes.
11 Q   And that's 58.4 percent then, the next Column
12   over?
13 A   That's correct.
14 Q   And then if I look back at Column F, it's showing
15   me that the predicted Dem vote total is equivalent
16   to what you would expect in a Dem -- Democratic
17   incumbent district; is that correct?
18 A   That's correct.
19 Q   Now, Exhibit 68 shows that there was a Republican
20   incumbent in District 2.
21 A   So I think what happened -- this is a
22   preliminary -- this was a preliminary version of
23   that that must have -- there must have been some
24   corrections I made. And I do recall a number of
25   situations where it was sometimes difficult to

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1   determine where an incumbent was because even the
2   resolution of the markers was not necessarily
3   clear. So I'm comfortable relying on the numbers
4   in Exhibit 71 as the accurate ones. So what is in
5   Exhibit 68 appears to be a preliminary version.
6 Q Are there any open seats in Exhibit 71? Any
7   predicted vote totals you can see that are
8   generated from open seats?
9 A Looking at this, it would be difficult to tell
10   because there is no designation about whether it's
11   open or not.
12 Q As I look at them, all the vote totals seem to
13   indicate that there's either a Democratic or
14   Republican incumbent; is that correct?
15 A I mean, I don't know. I'd have to go through and
16   check this line by line.
17 Q Well, looking at Exhibit 68, it shows four is an
18   open seat. I'm looking at District 4. The
19   predicted Dem vote is 10,276, which is what's
20   listed in the Dem Rinc Column affecting a
21   Republican incumbent.
22 A That's what it shows.
23 Q Now, there were some open seats in your
24   demonstration plan; that's correct? They weren't
25   all held by incumbents?

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1 A That's correct.
2 Q I'll show you what was previously marked as
3   Exhibit 10. This was a similar spreadsheet that
4   was done on your no incumbents all contested seat
5   baseline. Now, for open seats in -- with taking
6   incumbency into account, the numbers should be the
7   same as they were in Exhibit 10; is that correct?
8 A So I'm not sure what this is referring to, whether
9   it's Act 43 or the demonstration plan.
10 Q This is the demonstration plan, Exhibit 10. I'm
11   not seeing any of the districts from Exhibit 10
12   matching up with Exhibit 71.
13 A This is -- it's open seat data in Exhibit 10.
14 Q But some of the seats with your incumbents would
15   have still been open seats; correct? So some of
16   the numbers should be the same if I'm
17   understanding this correctly.
18 A It should be.
19 Q And as a general matter, an open seat -- a seat
20   that in your open seat calculation, not factoring
21   incumbency into account that is for a Democrat
22   that shows up as being won by a Democrat, if you
23   then assume that a Democratic incumbent's in the
24   district, the Democratic vote totals will be
25   larger; is that correct?

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1 A Say that again.
2 Q Sure. If we look at Exhibit 10 and this is all
3   open seats, and we see a district and it has a
4   particular Democratic vote total, and then if we
5   are going to assume that an incumbent is running
6   in that district, the Democrat's vote total will
7   increase; is that correct?
8 A It should be.
9 Q And the same thing as a Republican. A Republican
10   incumbent will increase the vote totals off of the
11   open seat baseline?
12 A It should be.
13 Q And if we look at -- I'll just compare
14   Exhibit 2 -- sorry, District 2 on Exhibit 10, I
15   see that the Democratic predicted vote is 11,805
16   votes and that's 54.1 percent. Do you see that?
17 A Uh-huh, yes.
18 Q And then if we look at Exhibit 71, District 2 now
19   has 12,899 votes and a 58.4 percent Democratic
20   vote share; is that correct?
21 A That's what it shows.
22 Q So that indicates that Exhibit 71 is reflecting
23   that there's a Democratic incumbent in that
24   district?
25 A That appears to be what it shows.

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1 Q And then if we look at Exhibit 70, if you look at
2   Exhibit -- District 2, it shows 11,255 Democratic
3   votes and a 51.8 percent Democratic vote share;
4   correct?
5 A So what are we comparing here?
6 Q District 2 across all these documents.
7 A Okay.
8 Q And so Exhibit 70 was a reflection that there was
9   a Republican incumbent in District 2; is that
10   correct? If you refer to Exhibit 67. Or sorry.
11 A I've got too many exhibits.
12 Q Too many documents. I was referring to the wrong
13   one. It's Exhibit 68. It shows a Republican
14   incumbent in District 2.
15 A That's correct.
16 Q And then when we look at Exhibit 70 which is based
17   off of Exhibit 68, we see the Democratic votes are
18   11,255 and a vote share of 51.8 percent; is that
19   correct?
20 A That's correct.
21 Q Now, that has decreased from the open seat
22   baseline because there's a Republican incumbent
23   running in that district?
24 A I believe so.
25 Q And what these numbers show, that it makes a

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1   difference depending on whether you assume there's
2   a Democratic or Republican incumbent running in
3   **each of these districts; isn't that right?**
4   A   That's correct.
5   Q   **If we wanted to get an accurate picture of what**
6   **the efficiency gap was under the demonstration**
7   **plan taking incumbency into account, we'd have to**
8   **correctly designate the incumbents that were in**
9   **each district?**
10 A   That's correct.
11   **MS. GREENWOOD:** Are we able to take
12 a break for a moment?
13   **MR. KEENAN:** Sure.
14   **MS. GREENWOOD:** Thanks.
15   (Recess)
16   **MR. STRAUSS:** There are some
17 discrepancies between what's on the
18 spreadsheets and what's in the rebuttal
19 report. Professor Mayer believes he can
20 explain what the cause is of those
21 discrepancies and can explain to you which he
22 believes are the correct numbers. He needs
23 to do some corrected calculations to provide
24 corrected spreadsheets. He would have to --
25 what we suggest is that you take this

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1   opportunity to ask him what he believes is
2   the reason for the discrepancy, what he
3   believes are the correct numbers, whether he
4   believes the differences make any material
5   difference to his opinion, and that he issue
6   a revised rebuttal report with the corrected
7   numbers in it. Is that agreeable to you to
8   proceed that way?
9   **MR. KEENAN:** It might be. I'd like
10 to ask him the questions.
11   **MR. STRAUSS:** Go ahead.
12   **MR. KEENAN:** And then I think I'm
13 not against providing a revised rebuttal
14 report, whether that's something he can use
15 in court or whatever, that -- whether that's
16 admissible in the trial or permissible, I
17 just don't know. I've never dealt with that
18 situation before. I don't want to commit to,
19 like, agreeing to that if it's not provided
20 for under the rules and things like that. I
21 just don't know how that works. So I'm not
22 saying you can't do it, but I don't know,
23 like, what the effect of it is.
24   **MR. STRAUSS:** Go ahead and continue
25 with your questioning then.

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1   Q   **Okay. So we had a colloquy with counsel about**
2   **some potential errors.**
3   **MR. STRAUSS:** Let me say this. The
4   alternative is for him to go home and for us
5   to adjourn the deposition now and for him to
6   go home and provide corrected spreadsheets
7   for you this afternoon, to do the
8   calculations at home and bring them back and
9   have you be able to question him about them
10 this afternoon. And we could do that if
11 that's what you would prefer.
12   **MR. KEENAN:** How long do you think
13 that would take?
14   **THE WITNESS:** Well, it would take
15 me 20 minutes to get home. I don't think it
16 would take me long. We're not talking about
17 hours. It might be a half hour or 40 minutes
18 of work just to do it and confirm it and come
19 back.
20   (Discussion off the record)
21   **MR. KEENAN:** I appreciate that
22 offer. I don't know if that just works with
23 my schedule today depending on how long it
24 takes in traffic and things. So I think I'd
25 like to continue asking questions at this

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1   point. I am open to a revised -- some sort
2   of revision to the report with corrected
3   calculations. I think we might have to
4   reserve the right to do a further limited
5   deposition about a revision. Would you be
6   agreeable to that?
7   **MR. STRAUSS:** Yes.
8   **MR. KEENAN:** I haven't confronted
9   this before with a rebuttal report and then a
10 correction, so I just don't know the legal
11 effect of that. So I just don't want to
12 commit one way or the other about what the
13 effect of that is.
14   **MR. STRAUSS:** Yes.
15 By Mr. Keenan:
16 Q   **Dr. Mayer, we have been talking about some**
17   **colloquy with counsel, and so I believe there may**
18   **be some errors in these spreadsheets and in the**
19   **report. So why don't you explain what you think**
20   **those are.**
21 A   So it looks like what happened is for some reason
22 in the spreadsheet in Exhibit 71, which I
23 originally had taken to be the correct numbers, I
24 had made an error in calculating every district as
25 having an incumbent. And I don't know why that

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1   happened. And after reviewing that, it now looks
2   to me, although I would want to confirm it, that
3   the numbers in Exhibit 69 and 70 are the correct
4   ones. So this would make a small difference in
5   the efficiency gap calculations and with the
6   correct identification of the seats that were open
7   and with the -- with incumbents.
8 Q And would the mistake in Exhibit 71 then also mean
9   that the swing calculations that you performed of
10   plus 3 and minus 5 would be -- need to be
11   corrected because those were based on Exhibit 71?
12 A Those numbers would likely change.
13 Q But it's your understanding that Exhibits 68 and
14   70 would provide -- or what you think would
15   provide the correct information for the
16   demonstration plan with incumbents?
17 A 69 and 70.
18 Q Oh, 69.
19 A I believe so.
20 Q And then what you're proposing to do is provide --
21   you would generate a document similar to
22   Exhibit 71 but with corrected vote totals and vote
23   percentages?
24 A What I would do is repeat the swing analysis with
25   confirming that I have the correct numbers.

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1 Q And then -- so I would say that I agree that you
2   should do that.
3 A Okay.
4 Q And then doing it today just didn't seem feasible
5   to me. I appreciate the offer. If we would have
6   run into this earlier in the day, maybe it would
7   have worked. I'd appreciate that as quick as we
8   could get it.
9   And then I also wanted to get into your --
10   you did some swing calculations on Act 43, and I
11   didn't see a spreadsheet that showed how you
12   arrived at those calculations. Would you be able
13   to produce -- it sort of would be the equivalent
14   to what Exhibit 71 -- I guess we're changing
15   Exhibit 71, but a similar type of document and
16   then with the swing analysis for Act 43 --
17 A I believe so.
18 Q And I would have raised that earlier with counsel,
19   but I just didn't realize it until too late.
20   MR. KEENAN: You mind if I take a
21   break?
22   MR. STRAUSS: That's fine.
23   (Recess)
24   MR. KEENAN: We're back on the
25   record. I just had a colloquy off the record

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1   with counsel about some interrogatories and
2   requests to admit that we served on the
3   plaintiffs which were objected to by
4   plaintiffs' counsel. I guess I can let
5   plaintiffs' counsel state the basis for the
6   objection which he just stated off the record
7   but get it on the record.
8   MR. STRAUSS: Well, if defense
9   counsel intends to ask the same questions
10   from the interrogatories to this witness, we
11   object to this question because it calls for
12   plaintiffs' expert to perform a calculation
13   at plaintiffs' expense that can equally be
14   performed by defendants paying their own
15   experts to do the calculation.
16   Professor Mayer has provided all the data
17   necessary to do the calculations. Defense
18   counsel can question him about how to do the
19   calculations, but we don't believe it's
20   appropriate or a proper use of the procedures
21   for expert discovery to shift the expense of
22   defendants' experts' work to plaintiffs,
23   making plaintiffs having to pay their expert
24   to do the work of defense experts for the
25   defendant. So we object to this witness

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1   being asked to do calculations at this
2   deposition for defense counsel.
3   MR. KEENAN: And I'm not conceding
4   that objection, but I will ask
5   Professor Mayer some questions about how he
6   would do that.
7   MR. STRAUSS: That's fine.
8   MR. KEENAN: So reserving we'll
9   possibly move to compel to get answers. But
10   I'll talk to Professor Mayer here.
11 By Mr. Keenan:
12 Q So I served a number of interrogatories upon the
13   plaintiffs which have the same basic form but
14   cover different geographic areas. And they asked
15   for using your baseline partisanship model to
16   identify the total number of votes that would be
17   predicted to be cast for Republican and then
18   Democratic candidates in particular --
19   MR. STRAUSS: Why don't you take
20   Interrogatory No. 1 and use it as an example.
21   MR. KEENAN: Sure.
22 Q So I just wanted to know how do I identify the
23   total number of votes --
24   MR. STRAUSS: Let's just read
25   Interrogatory No. 1 into the record.

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1   MR. KEENAN: Sure.
2 Q   "Using Mayer's baseline partisanship model,
3   identify the total number of votes predicted to be
4   cast for Democratic candidates for the Assembly in
5   all wards in the city of Milwaukee."
6   I understand that there was some objection to
7   the use of the term "all wards" that your model
8   used census blocks I believe, not wards. But the
9   point of this question is just to get the total
10   Assembly vote in the city of Milwaukee for
11   Democratic candidates. The plaintiffs have
12   responded that the data -- that defendants have
13   the data to run this calculation themselves.
14   How would the defendants and/or their experts
15   be able to determine the answer to Interrogatory
16   No. 1?
17 A I believe in the original discovery phase for my
18   original report, one of the files that was
19   disclosed was either a spreadsheet or an Excel --
20   or a Stata file that had the results for -- of the
21   baseline partisanship model for every ward in the
22   state.
23 Q And I'm going to go to the computer and we have
24   the -- okay. There's a file on this computer
25   which says "Mayer Discovery," and this is the

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1   Dropbox that was provided last time around for
2   your first deposition, and there are folders.
3   One's called Correspondence and one called Data.
4   I'm going to open the data file because I think
5   that's probably where this is. But if you could
6   identify on this computer what file you believe
7   could provide the answers to the interrogatories.
8 A It is -- I believe it's the file Ward Level
9   Election Data for Merge with Block File.
10 Q And then using that --
11 A No. I clicked on the wrong file. I'm an Apple
12   person.
13   So what I'm looking at is a spreadsheet that
14   has a number of columns. Can I just pull this
15   closer so I can sit down?
16 Q Sure.
17 A And it shows the ward-level results, both the
18   inputs and the outputs of my underlying baseline
19   partisanship model. And the first Column,
20   Column A, is called the Ward FIPS, F-I-P-S. FIPS
21   stands for Federal Information Processing
22   Standard. And that is a -- I believe it's a 13 or
23   15-digit number which is used to uniquely identify
24   different geographic areas. And so what you would
25   need -- what you would need is a file that the

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1   LTSB has for each ward that has the -- you would
2   have to link the file to that file using the FIPS
3   number.
4   And the reason that the ward names are not
5   included here is that I used this file to load
6   data into Maptitude. I used the FIPS number to
7   match up this file with other files that allowed
8   me to disaggregate the ward-level results down to
9   the block level. And I did that by the FIPS
10   rather than the name because the naming
11   conventions -- you're dealing with strings, and
12   those can also be nonstandard, whereas the FIPS is
13   a numerical -- unambiguous numerical indicator.
14   So what you would do after linking this to
15   the -- another file that lists the names, and
16   also -- you could also identify the county and the
17   municipality from the FIPS code because it's a
18   combination of the state FIPS, the county FIPS,
19   the municipality FIPS, and then the ward FIPS
20   code. So you could extract the -- there's a --
21   extract the FIPS code for Milwaukee and then
22   identify which of the wards were in Milwaukee and
23   then just do a summary, or a sum.
24 Q And then what computer program would I use --
25   MR. STRAUSS: We can provide you

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1   with a spreadsheet matching the ward names to
2   the FIPS codes.
3   MR. KEENAN: Okay.
4 Q Does this work just in Excel itself, or do you
5   have to, like, import it into something else?
6 A I did most of the statistical work in Stata just
7   because it's easier for me and there are functions
8   that allow you to collapse. But you could -- I
9   imagine you could do it in Excel. I'm not
10   familiar with how you do that. But you would just
11   need to aggregate the data to whatever level you
12   wanted, whether it was a city or county or some
13   other aggregation of different wards.
14 Q And if we're able to pull out the proper
15   municipality FIPS code, then that will tell us the
16   votes in Racine or Milwaukee or Madison or
17   whatever city we're looking for?
18 A That's correct.
19 Q All right. Well, I might be able to then handle
20   that, so we'll see. Basically I want to have a
21   way that I can give this number and not have it be
22   questioned as somehow doing it wrong. So that's
23   why I wanted plaintiffs on the record as to how to
24   do this the right way.
25   I have one small thing and I think everything

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1   else I would have would be related to this

2   changing numbers, so it's not really worth getting

3   into right now.

4   MR. KEENAN: Mark one more exhibit.

5   (Exhibit No. 72 marked for

6   identification)

7 Q I'll show you Exhibit 72 and if you could identify

8   that document for me. It's a few documents

9   connected together.

10 A These are invoices that I submitted to counsel for

11   October, November, and December of 2015.

12 Q And have you been paid for the invoices that are

13   in Exhibit 72?

14 A Yes.

15 Q And we had another set of invoices that we went

16   over the first time around and now we have this

17   set. Are those all the invoices you've submitted

18   to plaintiffs' counsel?

19 A Yes.

20   MR. KEENAN: All right. So that's

21   all I have for now.

22   MR. STRAUSS: I have a question or

23   two.

24

25

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1   RE-EXAMINATION

2   By Mr. Keenan:

3 Q Attorney Strauss mentioned the Joey Chen amicus

4   papers that were denied filing by the court. What

5   did you do to analyze the Chen report?

6 A I read it.

7 Q Is that all?

8 A That's the extent, yes.

9 Q Did you analyze his method of doing the randomized

10   districting at all?

11 A I'm familiar with it. I was familiar with it

12   prior to this, but I did not do any particular

13   analysis of this report.

14 Q So how much time did you spend reading Mr. Chen's

15   report?

16 A Between the report and the declaration, probably

17   an hour and a half.

18 Q And did you speak with Mr. Chen at all about it?

19 A I did not.

20   MR. KEENAN: And I don't know if I

21   need to put it on the record, but I think I

22   would object to Mr. Mayer at trial offering

23   additional opinions on either of his reports

24   about Mr. Chen's reports, but that's all the

25   questions I have.

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1   EXAMINATION

2   By Mr. Strauss:

3 Q Dr. Mayer, subsequent to you preparing your

4   rebuttal report, did you receive and did you

5   review a document entitled Dr. Joey Chen's

6   Analysis of Wisconsin's Act 43?

7 A I did.

8 Q And reading and reviewing that, does that inform

9   any of your opinions with respect to this case?

10 A It does.

11 Q And how does it?

12 A It is additional confirmation of my own analysis

13   that indicated that there was no geographic

14   clustering of -- differential geographic

15   clustering of Democrats and Republicans that would

16   produce a natural pro-Republican gerrymander.

17   Indicating that based on the calculations that I

18   had done with the Moran's I and the

19   Isolation Index, that there is no material

20   difference in how Democrats and Republicans are

21   distributed geographically around the state.

22 Q Okay.

23   MR. STRAUSS: That's all I have.

24

25

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1   MR. STRAUSS: All right. That

2   concludes the deposition for today.

3

4   (adjourning at 2:11 p.m.)

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 1   STATE OF WISCONSIN    )
                           ) ss.
 2    COUNTY OF DANE       )

 3      I, Taunia Northouse, a Registered Diplomate Reporter

 4   and Notary Public duly commissioned and qualified in and

 5   for the State of Wisconsin, do hereby certify that

 6   pursuant to notice and subpoena, there came before me on

 7   the 30th day of March 2016, at 9:03 in the forenoon, at

 8   the offices of the State of Wisconsin Department of

 9   Justice, 17 West Main Street, the City of Madison,

10   County of Dane, and State of Wisconsin, the following

11   named person, to wit:  KENNETH R. MAYER, PhD, who was by

12   me duly sworn to testify to the truth and nothing but

13   the truth of his knowledge touching and concerning the

14   matters in controversy in this cause; that he was

15   thereupon carefully examined upon his oath and his

16   examination reduced to typewriting with computer-aided

17   transcription; that the deposition is a true record of

18   the testimony given by the witness; and that reading and

19   signing was waived.

20           I further certify that I am neither attorney

21   or counsel for, nor related to or employed by any of the

22   parties to the action in which this deposition is taken

23   and further that I am not a relative or employee of any

24   attorney or counsel employed by the parties hereto or

25   financially interested in the action.
```

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```
 1           In witness whereof I have hereunto set my

 2   hand and affixed my notarial seal this 6th day of April

 3   2016.

 4

 5                       Registered Diplomate Reporter
 6                       Notary Public, State of Wisconsin

 7

 8   My commission expires
     May 17, 2019
 9

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Rebuttal Report: Response to Expert Reports of Sean Trende and Nicholas Goedert

Kenneth R. Mayer, Ph.D.

Department of Political Science

University of Wisconsin-Madison

December 21, 2015

This report presents my responses to the criticisms that Sean Trende and Professor Nicholas Goedert make of my report.[1]

I.   **Summary**

A.   Both Trende and Goedert erroneously argue that Democrats are more geographically concentrated than Republicans in Wisconsin, which creates a natural pro-Republican bias even under a neutrally-drawn district plan. Both arguments are based on unreliable methodologies, flawed measures, and lead to inaccurate conclusions. Trende's methodology for measuring partisan concentration relies on an unorthodox method (the PVI) far more common among political commentators than academics who study spatial patterns of concentration and isolation. Moreover, as he applies it here, Trende relies on fundamentally inaccurate measures of geography that are guaranteed to demonstrate that Democratic wards are closer to one another than are Republican wards.

Goedert's arguments about geographic concentration are analogous to Trende's, and suffer from the same flaws in that they are based on superficial claims that do not rely on actual measures of spatial concentration or isolation. Moreover, Goedert's claims here contradict his own research, in which he finds that even after controlling for urbanization (a proxy for concentration), Republican control of the redistricting process has a large and statistically significant impact on a plan's bias. A model in one of his papers (Goedert 2015) also shows that a court-drawn or bipartisan map in Wisconsin would be expected to produce a *pro-Democratic bias*. The model generates the same expectation for a court-drawn or bipartisan map in a state that resembles the country as a whole. Accordingly, based on Goedert's own analysis, there is no natural pro-Republican tilt in either Wisconsin or the typical U.S. state.

In contrast to Trende's and Goedert's unorthodox techniques, widely (even universally) accepted measures of spatial distributions, such as Global Moran's I (Cho 2003) and the Isolation Index (Reardon 2004), show that Wisconsin's Republicans and Democrats are equally spatially concentrated and equally spatially isolated from each other, and that in some election years *Republicans are more concentrated* than Democrats.

B.   Trende criticizes my method of estimating the partisanship of uncontested Assembly districts as biased. But his criticism stems from a superficial and erroneous discussion of a single figure in my report (Figure 2), and he erroneously believes that I set the Assembly votes in uncontested districts to the presidential vote in those districts. He does not take notice of the fact that my analysis was based on a comprehensive multiple regression model that controlled for the very factors that he claims create bias, nor that my model produces extraordinarily accurate forecasts of the actual data, using multiple methods.

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[1] "Analysis of the Efficiency Gaps of Wisconsin's Current Legislative District Plan and Plaintiff's Demonstration Plan," July 3, 2015.

C. Trende criticizes my baseline measure of partisanship for not taking into account factors such as incumbency, candidate quality, and spending. This is an inaccurate criticism, because estimating baseline partisanship is *designed* to control for incumbency, campaign spending, and candidate quality. This is the method preferred in the academic literature on redistricting, which seeks to understand the consequences of hypothetical plans (in which candidate quality, spending, and incumbency are unknown). My approach is *identical* to the method used by Professor Gaddie, who produced the baseline partisan estimates used by Wisconsin's map drawers in 2011.

D. Goedert challenges my model for estimating baseline partisanship in 2012, contending that I took into account information that the authors of Act 43 did not have (the 2012 election results). However, my baseline estimates of partisanship are nearly identical to those generated by Gaddie in 2011, indicating the same conclusions follow whether 2012 or pre-2012 data are used in the analysis. In addition, pre-2012 election results are highly correlated with 2012 election results, indicating that it would make no difference if I had used earlier election results. Goedert dismisses the convergence between my estimates and Gaddie's estimates as "mostly coincidental," but offers no evidence or data to support his assertion.

E. Geodert also challenges my efficiency gap calculations for ignoring the effects of incumbency, which he asserts that any author of a redistricting plan would incorporate. His criticism fails to acknowledge that controlling for incumbency is the standard methodology for estimating the partisan consequences of a hypothetical district plan. Nevertheless, I recalculated efficiency gap estimates for both Act 43 and my Demonstration Plan, taking incumbency into account. The substantive conclusions are identical: the efficiency gap for my plan increases slightly (but is still well within acceptable limits), as does the efficiency gap for Act 43. The *difference* between the two plans' efficiency gaps remains enormous.

F. Goedert criticizes my efficiency gap calculations for not including any sensitivity testing to determine whether my results are robust to changes in the statewide electoral environment. I conducted a uniform swing analysis over the range of plausible election results, based on the maximum and minimum statewide Democratic Assembly vote since 1992. This analysis shows that the efficiency gaps of both Act 43 and the Demonstration Plan are robust: Act 43's efficiency gap remains very high across this range, always significantly above the plaintiffs' suggested 7% threshold, and the Demonstration Plan's efficiency gap remains very low, and is always well below the threshold. Goedert is simply incorrect in asserting that the plans' respective efficiency gaps are not robust, and, again, offers no data or evidence to support his claim.

G. Throughout their reports, neither Trende nor Goedert has actually done any analysis that identifies problems with my analysis, or that specifically shows where my analysis is

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incorrect. Trende and Goedert merely offer speculative and unsubstantiated criticism, but never offer any substantive data or evidence that supports their arguments. And, as I will show, when they attempt to analyze Wisconsin's political geography, their conclusions are utterly wrong.

II.   The Claim that Wisconsin's Political Geography Has a Pro Republican Bias

While I will go into more detail on the specific points each report makes, I focus first on a central argument both Trende and Goedert make: that Wisconsin has a natural distribution of Republicans and Democrats that produces an intrinsic pro-Republican bias in a neutrally-drawn redistricting plan. They claim that because Democrats in Wisconsin happen to be (allegedly) naturally concentrated in small pockets of overwhelming Democratic strength, even a neutrally-drawn map would produce a large pro-Republican efficiency gap. As a result, they conclude, it is not possible to consider a large pro-Republican efficiency gap as evidence of gerrymandering.

I begin by noting that both Trende and Goedert ignore the role that political geography already plays in plaintiffs' proposed test. Under the test's first prong, if the state's motive in enacting its plan was simply to follow the contours of the state's geography, then partisan intent would not be present and plaintiffs would proceed no further in their claim. Similarly, under the test's third prong, if the state can show that its plan's large efficiency gap was necessitated by the geographic distribution of the state's voters, then the plan would be upheld. These points mean that geography is already properly incorporated into plaintiffs' proposal.

There are, additionally, two points that fundamentally negate the utility of this line of attack. First, the geographic concentration argument is predicated on the foundational assumption that a *neutrally-drawn map* would have produced a pro-Republican bias. Even if Trende and Goedert are correct in this assumption (which they are not), they take no position on whether the process in Wisconsin was, in fact, neutral. The record of the federal redistricting trial clearly shows that Act 43 was designed with the predominant purpose of benefiting Republicans and disadvantaging Democrats, and neither Trende nor Goedert contradicts the findings in my report of examples of blatant packing and cracking that are the very DNA of a partisan gerrymander.

And second, even if the state's experts are correct that political geography has produced the pro-Republican bias in Wisconsin's state legislative district plan (which they are not), it is impossible for them to quantify *how much* of an effect geography has had: is it 5%? 10%? 90%? 100%? Neither Trende nor Goedert have actually done any analysis that *demonstrates* that the alleged concentration of Democrats *in Wisconsin* will produce a pro-Republican efficiency gap, or any work that quantifies how concentration is related to efficiency gap calculations. They simply assert (incorrectly) that Democrats are more concentrated than Republicans, and therefore that even a neutral map will produce a pro-Republican bias.

But they are also wrong on the facts. Their argument about geographic concentration is based on flawed data and measures, and has no basis in accepted methods of measuring geographic concentration and isolation. Trende, in particular, uses an unorthodox method with

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no support in the peer-reviewed literature, and one that is guaranteed to produce a biased result that shows Democrats far more concentrated than they actually are. Goedert's argument contradicts his own published work, which shows that partisan control of redistricting generates a substantial bias even after partisan concentration is taken into account. His argument, further, falls victim to the Modified Areal Unit Problem, in that it is based entirely on the analysis of wards, ignoring the fact that wards are aggregated into districts. As I demonstrate, this aggregation process completely changes the applicability of Goedert's conclusions.

When I analyze the geographic distribution of Wisconsin's Democrats and Republicans using widely accepted measures of spatial concentration and isolation (Global Moran's I and the Isolation Index), I find that there is very little evidence of significant disparities in how the parties' voters have been distributed in recent election cycles. Republicans are in fact *more concentrated* than Democrats when measured by the 2012 Assembly vote.

A. Trende

Trende spends nearly half of his report (paragraphs 62-105) arguing that Democrats are naturally more concentrated ("clustered") than Republicans in Wisconsin, which creates a natural packing effect. Much of this discussion is entirely irrelevant to Wisconsin (Trende's discussion of patterns in the southern United States, Virginia, and differences between the 1996 and 2008 Democratic coalitions; see paragraphs 62-77). Trende also simply asserts that "there is little doubt that the Democratic vote in Wisconsin is also increasingly concentrated in fewer counties" (paragraph 71). He neither explains the relevance of the *county* vote to the issue of geographic distribution and legislative redistricting, nor why the county vote pattern in 1988 or 1996 is germane to the environment in 2012.

1. The PVI (partisan vote index) is the wrong quantity of interest

As applied to Wisconsin, Trende attempts to demonstrate that over the last 20 years Democrats have become more concentrated. His method relies on a quantity he calls the Partisan Lean Index, which is the party's county or ward vote share minus the party's statewide vote share, and appears to be analogous to the Cook PVI, which is the same quantity calculated using the congressional district vote and the national presidential vote. Trende argues that Democratic wards are closer together than Republican wards, which to him is evidence of geographic clustering that produces a natural pro-Republican redistricting bias.

The PVI (which is how Trende abbreviates the measure) is a quantity that is not commonly used in the academic literature, and when it is, it is used largely as a simple descriptive statistic. What this index does is simply redistribute the ward vote around the statewide average, and thus tells us which areas are more Democratic (or Republican) than the state as a whole, and which areas are less so.[2] It tells us little about overall partisan strength, and

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[2] The Cook Political Report notes that it "introduced the Partisan Vote Index (PVI) as a means of providing a more accurate picture of the competitiveness of each of the 435 congressional districts." http://cookpolitical.com/story/5604

is useful only in comparing elections at one level (here, counties or wards) to elections at another (the state).

The PVI is used almost exclusively by political commentators to describe congressional districts (the most widely known is the Cook PVI, which compares the average congressional district vote split over two consecutive elections to the average national presidential vote over those same elections). It is used less frequently in academic research, and then largely as a basic descriptive statistic used to classify districts as competitive or not. It is not used in the context of state legislative redistricting (Trende did not cite any studies that support the use of his measure, and could not identify any in his deposition).

Moreover, Trende appears to have made two errors in his calculation of the PVI.[3] First, while he states that his PVI is based on the top-of-the-ticket race in each year, he uses the gubernatorial elections as his top-of-the-ticket race in 2002, 2010, and 2014, but the U.S. Senate race in 2006, even though there was a gubernatorial race that year. While scholars may differ on whether a gubernatorial or U.S. Senate election is the correct top-ticket race, there is no justification whatsoever for being inconsistent.[4]

Second, in calculating his 2014 PVI, Trende mistakenly subtracted the *2014* statewide percentages from the *2012* ward totals (this is the code he used to generate the PVI for 2014; the error is highlighted, and "map_2012$r_share" is the ward vote for 2012):

```
map_2014=readOGR("Wards_Final_Geo_111312_2014_ED.shp",
"Wards_Final_Geo_111312_2014_ED")
map_2014=spTransform(map_2014, CRS("+proj=longlat +datum=WGS84"))
map_2014$r_share=map_2014$GOVREP14/(map_2014$GOVREP14 + map_2014$GOVDEM14)
map_2014$pvi=map_2012$r_share -
sum(map_2014$GOVREP14)/(sum(map_2014$GOVREP14) + sum(map_2014$GOVDEM14))
map_2014$pvi[which(is.nan(map_2014$pvi))]=0
```

Instead of the PVI, the actual ward level vote (or party vote share) is a much more direct measure of ward partisanship. I used LTSB ward level data from 2002 to 2014 to calculate the average Democratic percentage of the vote in a Democratic ward (all wards that were more than 50% Democratic in the top-ticket race), and the average Republican vote in wards where Republicans won more than 50% of the top-ticket vote. A graph of this data shows a very different pattern from what Trende claims (Republicans are in red; Democrats in blue):

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[3] These occurred in the R file "Wisconsin_clustering_computation.R" that Trende disclosed.
[4] This inconsistency could well affect Trende's results, as the vote percentages were vastly different in the two races in Wisconsin. Democrats garnered 53.8% of the two-party vote in the gubernatorial election, but 60.5% in the Senate race (GAB data).

Figure A: Average Democratic and Republican Vote
in Partisan Wards(where party won >50% in the top-ticket race)
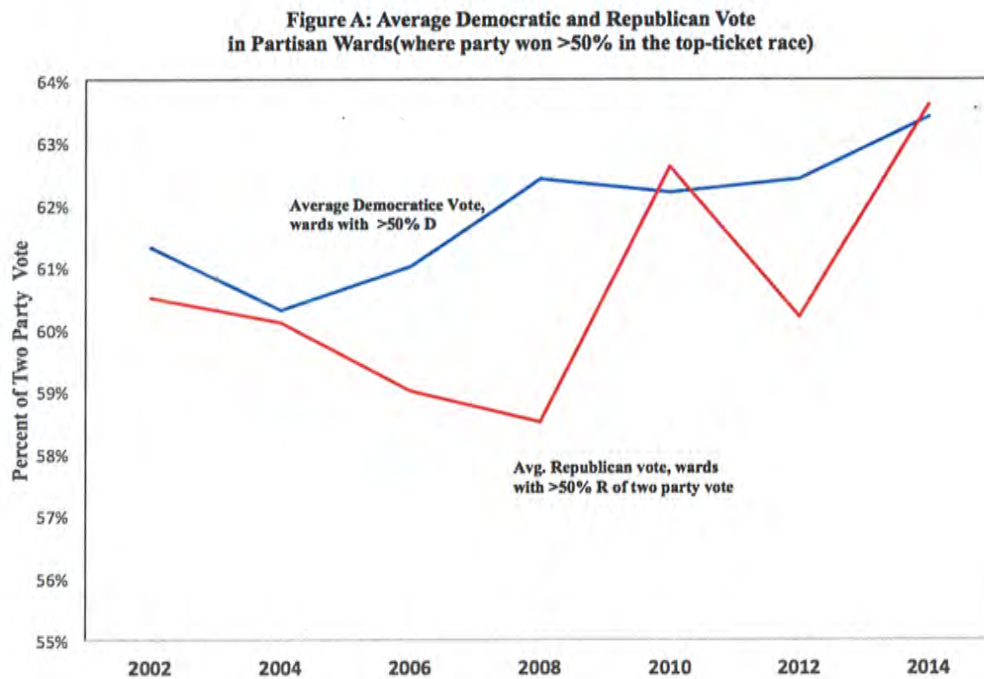
Here, we see that Democrats and Republicans have moved in almost identical fashion between 2002 and 2014. In 2002, Democrat wards were about 60.8% Democratic, and Republican wards were about 60.5% Republican in the top-ticket races. In 2014, similarly, both Democratic and Republican wards became more partisan: Democratic wards were 63.3% Democratic, and Republican wards 63.6% Republican.

Trende's claim that Democratic wards have become more Democratic, while Republican wards have not become more Republican (paragraphs 91-95), is simply false.

Trende offers no justification or support for why he is relying on the PVI measure rather than more direct indicators of ward partisanship; he merely asserts that it is a relevant quantity. Given that there are far more widely used and relevant measures of district level partisanship, his reliance on it in this context is unsupportable.

2. Trende's "Nearest Neighbor" Method is Inappropriate and Inaccurate

After introducing the PVI, Trende attempts to use it to demonstrate that Democrats have become more closely packed than Republicans (which, he asserts, produces a natural pro-Republican gerrymander). Apart from the irrelevance of the PVI, Trende's analysis uses a fundamentally flawed measure that is guaranteed to exaggerate the extent of Democratic concentrations. Instead of his measure, widely used and academically accepted metrics of concentration and isolation show that Democrats and Republicans are *both* highly segregated, and to about the same extent. Just as there are core areas of high Democratic strength in Milwaukee and Madison, there are similar Republican core areas in the "collar counties" of Waukesha, Ozaukee, and Washington.

The premise of Trende's argument is that pro-Democratic wards are closer to other pro-Democratic wards than are pro-Republican wards to other pro-Republican wards. His method, which I infer from his description, is to identify a pro-Democratic or pro-Republican ward of a certain percentage lean, and then to find the distance to the nearest ward with the *same* partisan lean. He determines the *median* distance between similar wards, and presents two graphs (about paragraph 98 in his report) showing that the median distance between similar Democratic wards is smaller than for Republican wards, and that as Democratic wards become more Democratic, they become closer to one another.

This is reminiscent of the nearest neighbor method used in the study of populations, but it bears little resemblance to how the concept is actually used in the literature, even in its earliest form (Clark and Evans (1954) used it to study the distribution of plant and animal populations).[5] His application of this method is highly unorthodox, unsuited to the study of redistricting, and not based on any accepted peer-reviewed academic work (he does not cite a single study in support of his method).

Trende's method is to start with a ward (call it i), calculate its PVI and assign it to a quantile, and then locate the closest ward that shares this PVI quantile (call it j). The geographic distance between wards i and j (presumably calculated using the ward centroids, although Trende fails to specify this key detail) is then recorded (paragraph 97). The process is repeated for every ward over every election from 2002 to 2014, producing for each election a matrix consisting of every ward and the distance to the nearest ward with the same PVI quantile. He then calculates median distances between wards of the same PVI quantiles, which he claims shows that Democratic wards are, and have been continuing to move, closer together than Republican wards.

There are several problems with this approach. First, and most fundamentally, the proximity of similar wards is simply not a measure of geographic concentration or clustering. Trende's method tells us nothing about which wards are actually *adjacent* to wards of a certain PVI. It only tells us how far these wards tend to be from other wards of the same partisan lean. It is entirely possible for wards of the same partisan makeup to be far apart but still easy to join in the same district (think of a sparsely populated but uniformly partisan area). Likewise, it is entirely possible that wards of the same partisan makeup are close together but quite difficult to combine in the same district (think of a densely populated but politically heterogeneous area). Trende's method cannot distinguish between these scenarios, and as a result it cannot tell us anything about the geographic patterns that actually matter for redistricting.

Second, Trende does not explicitly define in his report what a "similar partisan index" (paragraph 97) means. Clearly, Trende is classifying them in some way, defining "similar" as within some range, as his vague discussion of quantiles indicates (paragraph 98). But without specifying the range, it is impossible to know whether his measure has any meaning. Different

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[5] Byers and Raferty (1998) use a near neighbor method to estimate the statistical relationship between points in space and how they differ from random distributions, or "clutter," in the context of distinguishing landmines from other objects during aerial reconnaissance. Neither their work nor Clark and Evans (1954) supports Trende's use of the method.

classification methods -- requiring a match of, say, within 0.1 percentage points, or classifying according to deciles or some other method -- are likely to yield very different results than requiring a match of within 0.5 or 1.0 percentage points or using a larger number of categories. His graphs suggest he is using some type of percentile distribution (the x axis label refers to "(.05% is the most Democratic [or Republican] Ward)," but he does not explicitly define why he chose this particular scheme or how he calculated the quantiles. On this point alone, his method lacks validity or replicability.

But there are two additional serious – fatal, in fact – flaws in this method. First, in treating the geographic distances between wards as his quantity of interest, Trende does not take into account the fact that wards in Wisconsin are not uniform in area. Ward areas actually vary widely: some are very small, others are moderate in size, and still others are very large (wards are drawn within specified population limits, but their geographic areas are not similarly constrained).

Table A shows the mean and median areas (in square miles) of Wisconsin wards. The average is 8.41 mi^2, but the range is huge: the smallest ward with a nontrivial population is in the City of Middleton: ward 19, with 690 people in an area of 0.0071 mi^2. The largest ward in the state is in the Town of Winter: ward 2 (in Sawyer County), with 565 people in an area of 227.7 mi^2.

Geographic distances between ward centroids will, obviously, depend on how large the wards are. Although centroid-to-centroid distances will not map perfectly onto area differences (because the distances will vary with the shape and orientation of wards), two large wards – even if they are adjacent – will show up as much farther apart than two smaller wards that might be separated by numerous other wards and municipal boundaries.

The problem is magnified when we observe that ward sizes are correlated with other relevant variables, particularly whether a ward is in a city, and most crucially, whether it is a Democratic or Republican ward:

Table A 2012 Ward Sizes (square miles)[6]		
	Mean	Median
Statewide Average	8.41	1.12
City of Milwaukee	0.29	0.20
Rest of State	8.83	1.27
Democratic Wards	5.91	0.56
Republican Wards	10.96	3.45

Wards in the city of Milwaukee have a mean area of only 0.29 mi^2, which is 3% of the size of the mean area statewide. Democratic wards (measured by whether the 2012 Democratic presidential vote was above 50%) are, on average, only about half the size of Republican wards (5.91 mi^2 vs. 10.96 mi^2).

In relying on the distance between wards, Trende is thus putting his thumb on the scale; all other things equal, this method will *always* show Democratic wards to be much closer than Republican wards, irrespective of whether this concentration is real or merely an artifact of ward area. To put it most simply, smaller Democratic wards will *always* appear closer than larger Republican wards.

But a second and equally serious problem lurks. Trende does not use the *mean* distance between wards as his quantity of interest, but rather the *median*. He justifies this choice "because outlying wards, such as Menominee County, exert an undue amount of leverage on averages" (paragraph 97).

This is the wrong measure, because the "nearest neighbor" approach is unlikely to pair, say, a ward in Milwaukee with a ward in northwest Wisconsin. Menominee County will not exercise "an undue amount of leverage" because it is an outlying ward. It will exercise an undue amount of leverage because it *has a very large area* (222.8 mi^2), which is something Trende should, but does not, correct for.

His use of the median rather than the mean further exaggerates the difference between Republican ward distances and Democratic ward distances. The average Republican ward area is 1.9 times larger than the average Democratic ward area (10.96 vs. 5.91 mi^2). But the *median* Republican ward is *6.2* times larger than the median Democratic ward (3.45 mi^2 vs. 0.56 mi^2).

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[6] Calculated directly from the LTSB shape files of 2012 wards, obtained from http://legis.wisconsin.gov/gis/data.

Because the disparity is three times larger for the median versus the mean area, Trende is further stacking the deck in favor of his preferred hypothesis.

I was able to replicate Trende's analysis, using LTSB data and the R code he disclosed. When the mean distances between similar wards are included, Figure B is the result for the 2012 Election:[7]

Figure B
Nearest Neighbor Analysis: Mean vs. Median Distance
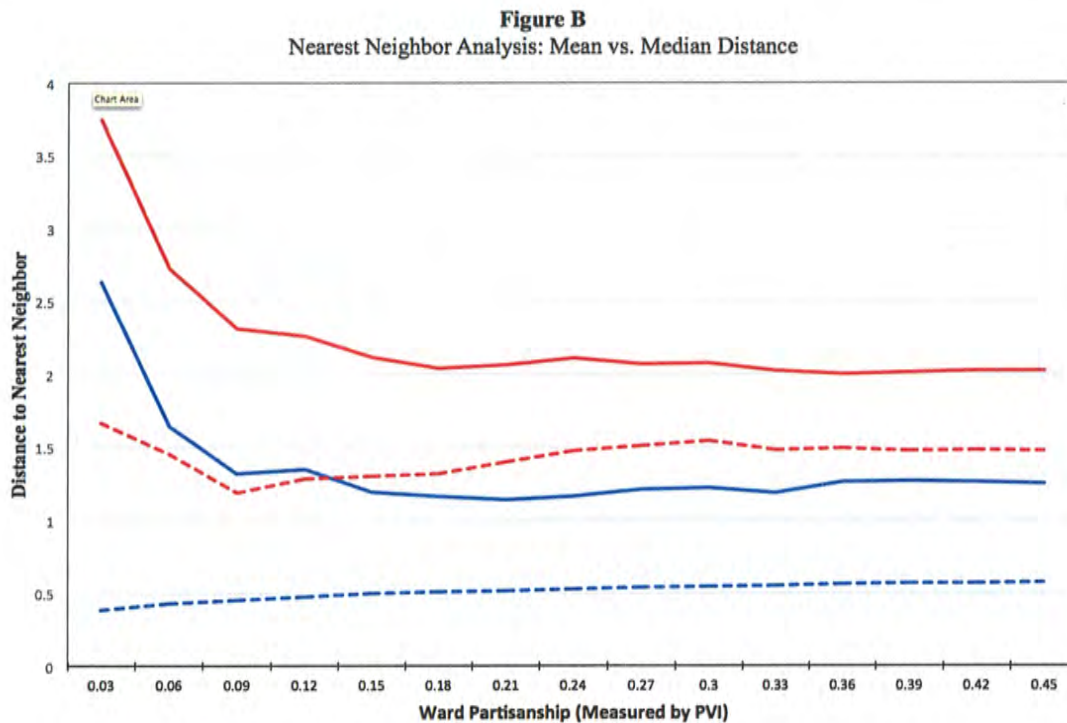
In this graph, the dotted lines are the median nearest neighbor distances for Democratic (blue) and Republican (red) wards, replicating what Trende did in his median distance graphs around paragraph 98 in his report. Wards become more partisan as we move from right to left.

The *mean* distances are shown with solid lines. While Republican wards remain farther apart than Democratic wards, the mean distances for both parties are much larger than the median distances. Proportionally, Republican and Democratic wards are much closer together in mean than in median distances (which is what one would expect, given the exaggerated difference between median Democratic and Republican ward sizes). Specifically, the mean distance between Republican wards is only about 70% larger than the mean distance between Democratic wards, compared to a 180% difference between the median Republican and Democratic distance.

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[7] The pattern Trende identifies is largely constant across all elections; adding the additional cycles will not change the results.

More relevant is the shape of the mean distance lines. They show that Republican and Democratic distances move precisely in parallel, and that strongly Democratic wards are significantly *farther apart* than weaker Democratic wards (as are strongly Republican wards). This is the complete opposite of Trende's claim that stronger Democratic wards are closer together than weaker Democratic wards, and it obliterates the core of Trende's report: the assertion that the pro-Republican bias evident in Act 43 is the natural result of Democrats being more geographically concentrated.

To conclude, Trende's argument about Democratic concentration is based on an irrelevant measure of partisanship (PVI) that is incorrectly calculated, applies a methodology that bears no relationship to any scholarship or actual research on spatial distribution, ignores a key feature of Wisconsin's actual political geography (ward area), relies on an improper distance measure that is enormously biased in favor of his hypothesis, and produces a result that fundamentally misrepresents what the data actually shows. Because of his use of a questionable method and fundamentally flawed measures, Trende's opinions should be regarded as uninformative.

B. Goedert

Goedert, like Trende, asserts that Wisconsin's natural geography creates an intrinsic pro-Republican bias in redistricting (p. 17). He cites his own research that geography produced a pro-Republican bias in the 2012 congressional election (p. 19).

The only analysis Goedert conducts as to Wisconsin is an examination of wards, which he claims shows "the bias inherent in Wisconsin's geography" (p. 21). His analysis is a simple "uniform swing" study of wards in 2012, adjusting the Democratic presidential vote in each ward downward by 3.5% to determine the overall ward distribution in the event of a tied election (Figure 1, p. 22). He asserts that based on this analysis, "Republicans would win 60.2% of wards, comprising 54.4% of the voting population" in a tied election (p. 22). This is the extent of his analysis.

This analysis, however, is a non sequitur, because it fails to aggregate wards to the relevant geographic level, which is *districts*. Goedert's failure to take this into account is an example of the Modified Areal Unit Problem, in which inferences at one level of geography frequently do not hold at other levels of aggregation; see King (1996). In this example, the ward level vote is far less relevant than the district level vote, because it is entirely possible that wards will be aggregated in such a way that the pattern he observes either disappears (or even reverses).

When we examine the distribution of *districts*, which have a population deviation small enough that we can consider them equal (the deviation under Act 43 is 0.76%), we in fact see almost the reverse pattern. The following graph (Figure C) displays Goedert's adjusted ward level presidential vote in a simulated 50-50 election, along with an adjusted baseline forecast for Act 43 districts, using my baseline open seat model, in a simulated tied election. Both wards and districts are weighted based on the number of votes cast in each unit. This allows me to directly compare ward level results to district level results:

Figure C: Distribution of Wards vs. Districts
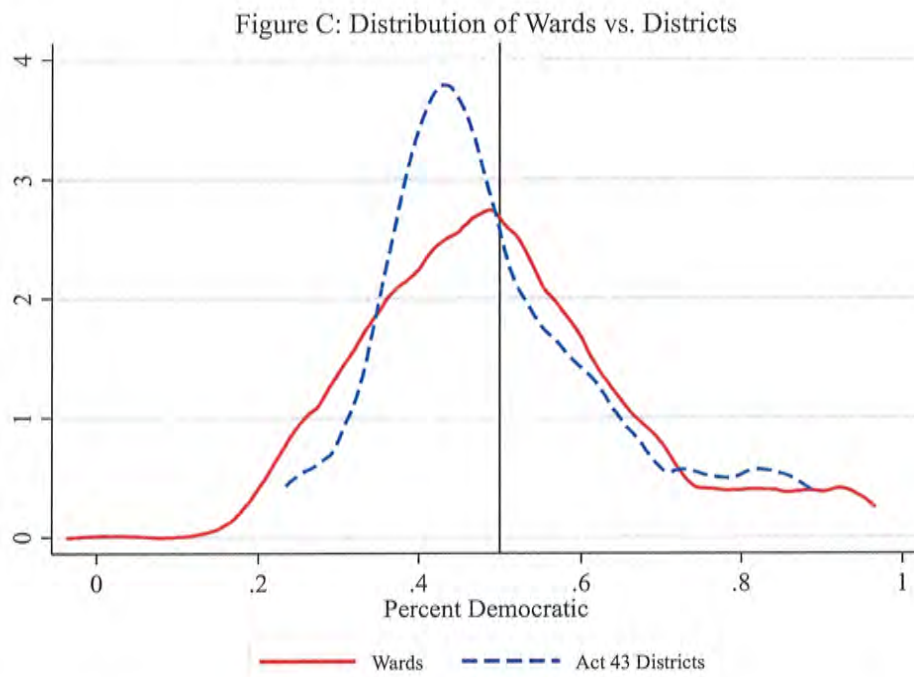
What this figure demonstrates is that as wards are aggregated into districts, the distribution substantially changes. The red line is a kernel density plot of the ward Democratic vote percentage in a simulated tied election; it is a continuous version of the histogram Goedert presents in his Figure 1. The dotted blue line shows the predicted Democratic vote in Act 43 districts in a simulated tied election – or, what occurs after the wards are aggregated into Assembly districts. The overall shape of the curves, the mode of each distribution, and even the mean vote percentage vary as we aggregate from wards up to districts. Knowing the ward distribution ultimately does not tell us much about what the distribution of districts will look like; the process of aggregation is crucial.

More significantly, the district distribution is much more tilted in a Republican direction than is the ward distribution. The ward distribution is nearly normal in shape, and has a peak very close to 50% Democratic. In contrast, the *district* distribution is skewed to the right, and has a much higher peak around 42% Democratic, meaning that there are many more districts that Republicans win by relatively small margins (indicating that Democrats are cracked), and many more districts where Democrats win by much larger margins (indicating packing). Accordingly, the district distribution does *not* mirror the underlying distribution of wards. Rather, it reveals that Act 43's designers were able to distort a fairly neutral ward distribution into a far more advantageous district distribution, through gerrymandering.

1. Goedert's Published Work Contradicts His Report

Goedert's own prior work indicates that unified party control of state government has an independent and significant effect on the bias of redistricting plans, even after controlling for

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population concentration. This work also indicates that if Wisconsin, or a state resembling the country as a whole, had a court-drawn or bipartisan map in 2012, this map would have had a slight *pro-Democratic* bias. These findings further obliterate the claim that Act 43's extreme partisan tilt resulted from Wisconsin's natural political geography.

In a 2014 article, Goedert analyzes the consequences of different redistricting processes, looking for evidence that partisanship and geography each have an independent effect on the partisan bias of redistricting plans.[8] Using an unorthodox definition of gerrymandering – Goedert defines *any* redistricting plan created in a state with unified party control of state government as a partisan gerrymander – he finds that in states with more than six congressional districts, both urbanization (a proxy for Democratic concentration) and unified party control have a strong and statistically significant effect on the bias of a district plan (2014, 6). Goedert interprets his results as indicating that geography matters, and that higher urban concentration leads to more bias against Democrats (2014, 6). But what his results also show is that *even after taking urbanization into account*, the partisanship of the map drawers introduces a separate and significant bias: Republican-drawn maps are associated with an additional *13.6%* pro-Republican bias.

Geodert updated his 2014 article in a more recent manuscript, which incorporated the results of the 2014 midterm elections. Here, he finds that urbanization *no longer has a statistically significant effect* on the bias of district plans (2015, 6). Yet he stills finds evidence that the partisanship of map-drawers has a significant effect on district plans' bias (in 2014, a Republican-drawn plan adds 12.4% bias, or roughly the same as the 13.6% estimate for 2012).

So, on the one hand, Goedert's own work comes to different conclusions about the impact of urbanization (or Democratic concentration): sometimes it matters, other times it does not. But his work is consistent about the effect of partisan control: when partisans draw maps, they *always* do so in ways that dramatically bias plans in their favor. The clear inference is that geography matters much *less* than partisan control in explaining plans' electoral consequences.

Furthermore, we can use Goedert's regression model to generate a forecast of what would have occurred in 2012 in Wisconsin – as well as in a state resembling the country as a whole – under a neutral process (i.e., a court-drawn or bipartisan plan). His regression model includes the following variables (2015, 11):

1. Whether a district plan was drawn by Democrats or Republicans (court-drawn and bipartisan plans are the excluded category)
2. A state's African American population percentage
3. A state's Hispanic population percentage

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[8] Goedert's definition of bias is essentially identical to the efficiency gap. He "compare[s] the mean vote share with the expected seat share under a 'fair' map with zero bias and a historically average seats-votes curve" (2014, 3). In the "historically average seats-votes curve," "a 1% increase in vote share will produce about a 2% increase in seat share," which is the same seat-vote relationship implied by a zero efficiency gap (2014, 3). Goedert's bias estimates are thus largely indistinguishable from the efficiency gap calculations of Stephanopoulos and McGhee (2015).

4. The percentage of a state that is urbanized (according to the Census)
5. The statewide Democratic vote
6. The number of congressional seats.

With the coefficients of this model, and the appropriate data for Wisconsin (or any other state), we can calculate what the expected bias would be for a plan in 2012.[9] The dependent variable here is a measure of bias almost identical to the efficiency gap, with positive values indicating a pro-Democratic bias, and negative values a pro-Republican bias. Because this is a linear regression, we can multiply each coefficient by the value of the independent variable, and then sum the results to generate a forecast from any set of data values. In Table B, I set both Democratic and Republic Gerrymanders to 0, simulating a neutrally-drawn plan:

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[9] Goedert generated two models, one for states with fewer than 6 congressional districts, and another for states with more than six. As Wisconsin has 8 districts, I use the latter.

	Table B Goedert's Regression Model for 2012 Dependent Variable: Pro-Democratic Bias in a District Plan		
Variable Name	(a) Coefficient Value	(b) Variable value for Wisconsin	Value (a) x (b)
Democratic Gerrymander	16.6	0	0
Republican Gerrymander	-13.6	0	0
% Black	-0..29	6.6	-1.914
% Hispanic	0.77	6.5	5.005
% Urbanized	-0.72	70.2	-50.544
Statewide Democratic Congressional Vote	0.11	50.8 (2012)	5.588
Number of Seats	-0.16	8	-1.28
Constant	45.0	1	45
Total	(sum of all values)		1.855

Goedert's regression model thus predicts that if Wisconsin had a neutrally drawn plan in 2012, the resulting map would have had a *pro-Democratic* bias of 1.855%. In other words, in the absence of unified Republican control over the redistricting process, Wisconsin's demographic, geographic, and political characteristics would have resulted in a small natural *Democratic* advantage. And this is no fluke of the state or the election year. We can also use Goedert's model to predict what would happen in a state resembling the United States as a whole (i.e., a state that is 13.2% black, 17.4% Hispanic, 80.7% urbanized, 51% Democratic, and with

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8.7 congressional seats[10]). Substituting these values into the regression model shows that in an "average" state, a neutrally-drawn map would have had a *pro-Democratic bias* of 0.684% in 2012.

Goedert's 2014 variant of the model (2015, 13) further predicts that Wisconsin would have had a *pro-Democratic bias* of 4.392% in 2014, and that the average state would have had a *pro-Democratic bias* of 1.589%. At this point, it is hard to see what is left of the thesis that political geography inherently favors Republicans. If anything, Goedert's own published analysis shows that Wisconsin's political geography slightly favors *Democrats*.

C. Accepted Measures of Geographic Concentration and Isolation Show that Democrats and Republicans are Equally Dispersed

In arguing that Republicans in Wisconsin enjoy a natural geographic advantage, both Trende and Geodert use ad hoc, unorthodox measures of concentration that are neither relevant nor accepted by the academic literature. In fact, there exist widely accepted metrics of geographic concentration and dispersion, used by geographers and demographers to study spatial patterns. Two of the most common are Global Moran's I (Anseln 1995; Cho 2003), and the Isolation Index (Glaeser and Vigdor 2012; Reardon 2004). I use these metrics to determine how Democrats and Republicans in Wisconsin are actually distributed.

Moran's I is a measure of spatial autocorrelation, or how values of a variable in space correlate with values in nearby space. It can be calculated for an entire geographic system (Global Moran's I), or for any specific point in space (Local Moran's I). The Isolation Index indicates, for the average member of a group residing in a certain geographic unit (such as a ward), what share of the member's neighbors in the unit belong to the same group (Iceland and Weinberg 2002, 120). It measures how geographically isolated a group is (Reardon 2004, 153), and it can easily be adjusted, by deducting a group's share of the statewide population, to show how much *more* isolated a group is than we would expect given its statewide size (Glaeser and Vigdor 2012, 2). Both Moran's I and the Isolation Index are widely used in studies of residential segregation and sorting (Chung and Brown 2007; Massey and Denton 1989; Glaeser and Vigdor 2012; Dawkins 2007; Reardon 2004; Iceland and Weinberg 2002), epidemiology (Moore and Carpenter 1999), network effects (Cho 2003), and political geography (Glaeser and Ward 2005). The measures are also used by the U.S. Census Bureau itself (Iceland and Weinberg 2002).

Both Moran's I and the Isolation Index are directly applicable to the issue of measuring the geographic distribution of Democrats and Republicans in Wisconsin. In this context, Global Moran's I tells us how likely Democrats are to live clustered next to other Democrats (and Republicans to Republicans), and the Isolation Index, adjusted as noted above, tells us to what extent the average Democrat (or Republican) lives in a ward that is more heavily Democratic (or Republican) than the state as a whole. I use these indices to directly assess the geographic distribution of Democrats, and, more importantly, to compare it to the geographic distribution of Republicans.

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[10] Calculated as 435/50.

Global Moran's I is analogous to a correlation coefficient, and ranges from -1 to 1; scores close to 1 indicate a very high spatial correlation (i.e., clustering) of Democrats (or Republicans). The Isolation Index ranges from 0 to 1, and, adjusted as noted above, indicates to what extent the average Democrat or Republican lives in a ward that is more heavily Democratic or Republican than Wisconsin as a whole. In calculating both measures, I use the ward as the basic unit of geography and actual Assembly votes.[11] Because I only have geodata for the current wards, I only estimate Global Moran's I for 2012 and 2014. For the Isolation Index, I compute scores dating back to 2004. Both Global Moran's I and the Isolation Index are asymmetrical, and so must be calculated separately for Democrats and Republicans.

Table C shows the values of the Isolation Index, adjusted as noted above, for Democrats and Republicans in Wisconsin from 2004 to 2014:

Table C Isolation Index		
	Dem-Rep	Rep-Dem
2014	0.23	0.20
2012	0.14	0.12
2010	0.15	0.17
2008	0.15	0.14
2006	0.16	0.17
2004	0.20	0.21

As is evident from Table C, Democrats were slightly less isolated than Republicans in 2004, 2006, and 2010, and slightly more so in 2008, 2012, and 2014. In all cases, the differences in isolation were very small, amounting to only one to three percentage points (out of a scale extending from 0% to 100%). In the 2012 election, for instance, the average Democrat lived in a ward whose Democratic vote share was 14% more Democratic than the state as a whole; analogously, the average Republican lived in a ward whose Republican vote share was 12% more Republican than the entire state. In the previous election, it was Republican voters who were more isolated than Democratic voters (17% versus 15%). This analysis in no way supports the claim that Republicans are more advantageously distributed than Democrats; on the contrary, both parties' supporters are almost identical in their geographic isolation over the last decade, and there is no clear temporal pattern. In some years, Democrats are marginally more isolated than Republicans, and in other years Republicans are marginally more isolated than Democrats.

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[11] I calculated Global Moran's I using the method in Bivand and Piras (2015) and the R module spdep available at https://cran.r-project.org/web/packages/spdep/index.html. I calculated the isolation index using a Stata module (seg), available at http://econpapers.repec.org/software/bocbocode/s375001.htm.

The results are very similar with the Global Moran's I, again calculated for Democrats and Republicans in Wisconsin, although only for the two elections (2012 and 2014) for which the geodata is readily available:

Table D Global Moran's I		
	Democrats	Republicans
2014	0.75	0.68
2012	0.68	0.69

Here, we see that Democrats were slightly less spatially concentrated than Republicans in 2012, but slightly more spatially concentrated in 2014. The differences in both cases are tiny: 0.01 in 2012 and 0.07 in 2014, on a scale that stretches from -1 to 1. The message is quite clear: *both* Democrats and Republicans in Wisconsin tend to live near one another in distinct clusters, but there is no evidence that Democrats are *more* geographically clustered than Republicans.

Accordingly, two widely used and accepted measures of geographic distribution show no consistent pattern, and no material difference in how Wisconsin's Democrats and Republicans are dispersed spatially. In no sense, therefore, is it an accurate statement that Democrats are much more concentrated than Republicans – the unsubstantiated claim that comprised the core of both Trende's and Geodert's arguments about natural gerrymanders.

III.   **Trende's Claim That My Vote Model Is Biased Is Incorrect**

Trende claims that there may be "a systematic bias involved in imputing presidential results to state House results" (paragraph 135). As evidence he points to Figures 2 and 3 in my original report, which display the relationship between the ward level presidential vote and the ward level Assembly vote. Trende notes that Figure 2 shows that there is close to a 1:1 relationship between Republican presidential and Assembly votes, as the dots on the graph are distributed around the 45-degree line:

Figure 2: Presidential Vote and Assembly Vote 2012
Republican Votes by Ward - Contested Districts
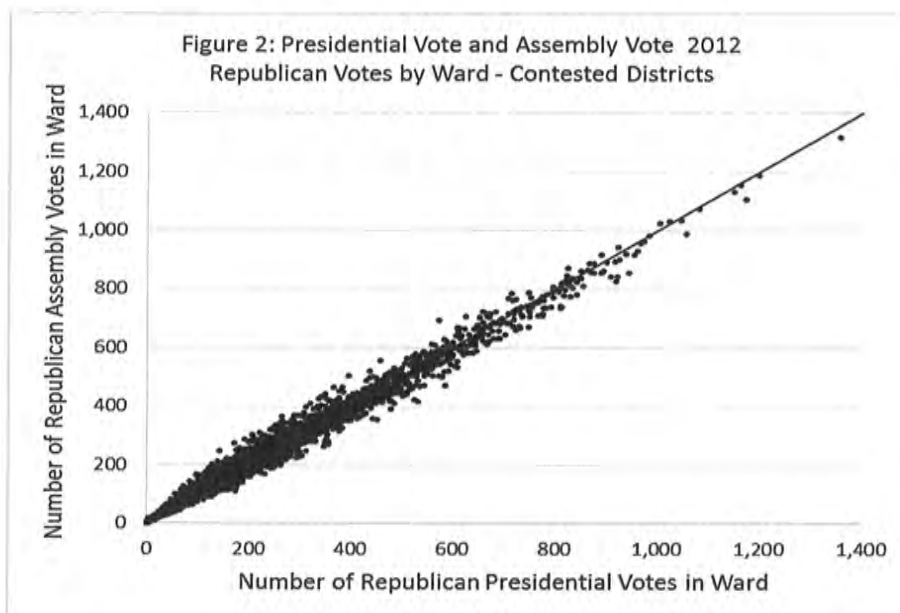
However, Trende claims that the relationship is different for Democratic votes (Figure 3 in my original report):

Figure 3: Presidential Vote and Assembly Vote 2012
Democratic Votes by Ward - Contested Districts
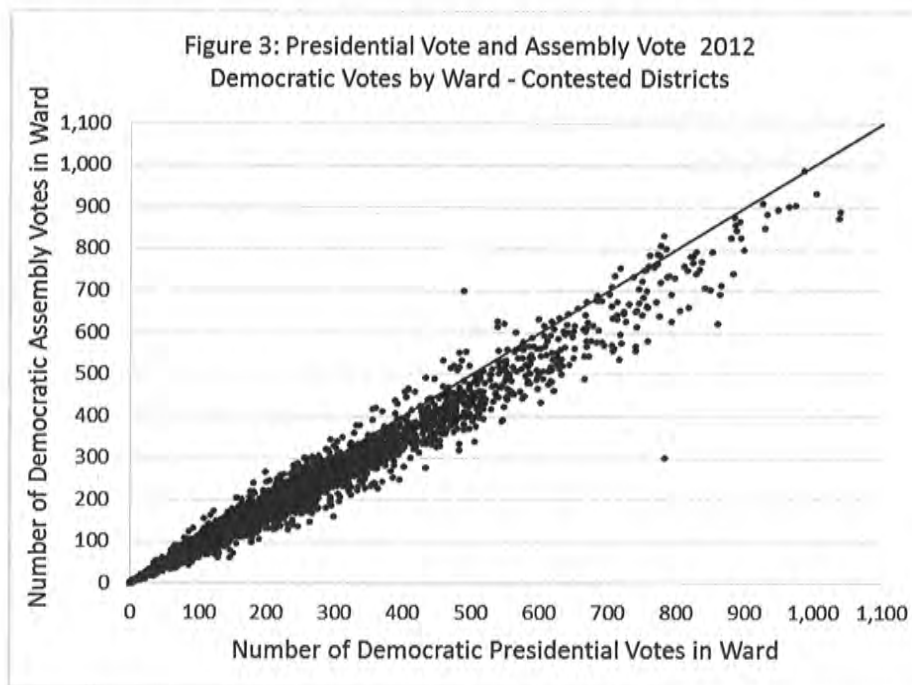
Here, Trende argues, the "dots systematically fall below the line, often creating differences on the order of 10 percent" (paragraph 138). This pattern, he asserts, will "skew the imputation" of votes, resulting in "too many votes [being] imputed in wards reporting a high number of Democratic votes" (paragraph 139).

Trende is completely and unambiguously wrong in this claim, which belies a fundamental lack of understanding of multiple regression and the causes of bias in statistical models. Trende appears to believe that I simply assumed that ward level Democratic Assembly votes are actually *equal* to ward level Democratic presidential votes, or that in estimating the Assembly vote in uncontested wards I merely used the value of the presidential vote (presumably because that is how he imputes the vote in uncontested districts in his own analysis; deposition page 83).

That is wrong. I displayed this graph merely to show that there is in fact a strong relationship between the two variables. The fact that the Democratic Assembly vote tends to fall below the presidential vote is completely irrelevant to any possible bias. In fact, regression analysis estimates the relationship between the two quantities by identifying the *slope* of the line that relates them, not how the relationship varies across a 45-degree line.

Below (Figure D) is a graph that plots the data in Figure 3 of my original report along with a fitted line of predicted values from a bivariate regression of the Democratic Assembly vote on the Democratic presidential vote. The red line consists of the predicted values of the Democratic Assembly vote in each ward:

Figure D: Presidential Vote and Assembly Vote 2012
Democratic Votes by Ward - Contested Districts
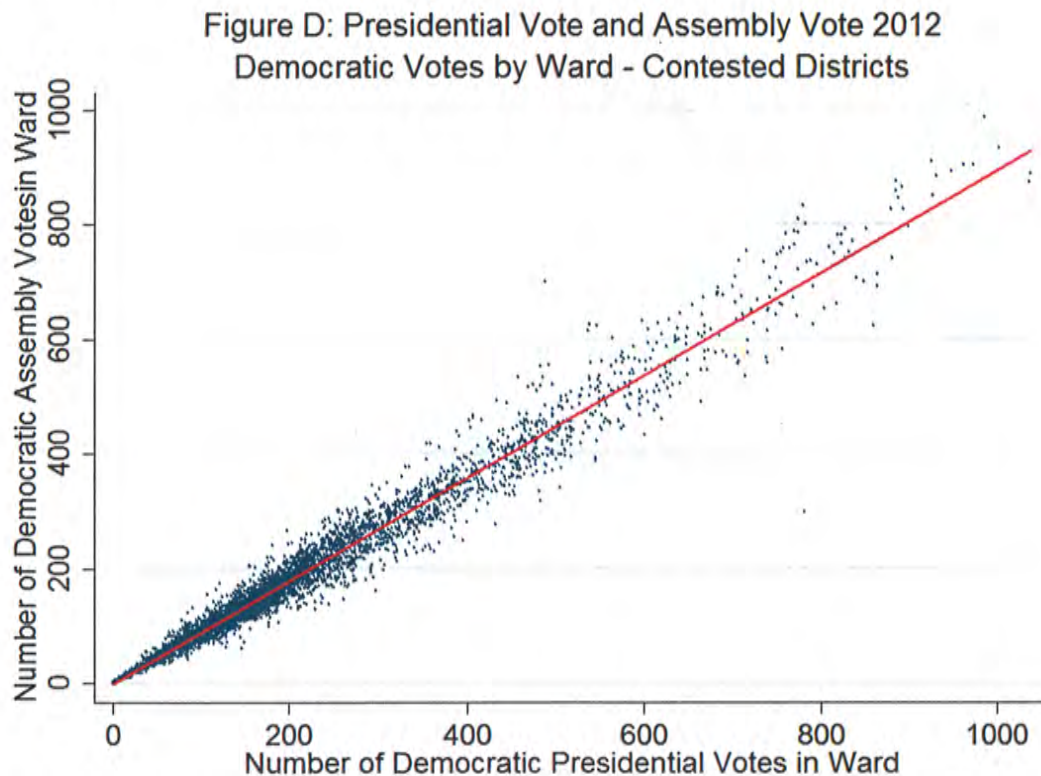
Here, we see that the fitted line runs *exactly* down the middle of the plotted points. My regression analysis of the Democratic Assembly vote (Table 1 in my original report) shows that the coefficient for the Democratic presidential vote is 0.931 (p<0.0001), which is precisely the pattern than we see in the bivariate relationship above. In a linear model, this coefficient is the

slope of the line that relates the presidential vote to the assembly vote. It is less than 1 (a 45-degree line), indicating that the Assembly vote rises more slowly than the presidential vote; i.e., the predicted Assembly vote will lie below the 45-degree line in Figure 2.

And, as is immediately apparent from the actual results of my regression (Figure 4 in my original report, which plots the actual vs. predicted ward level votes), there is no bias in the results. In this graph, the 45-degree line is where the *predicted* Assembly vote would fall if it were exactly equal to the actual Assembly vote:

Figure 4: Ward Level Predicted vs. Actual Assembly Vote - 2012
Both Parties, Contested Districts
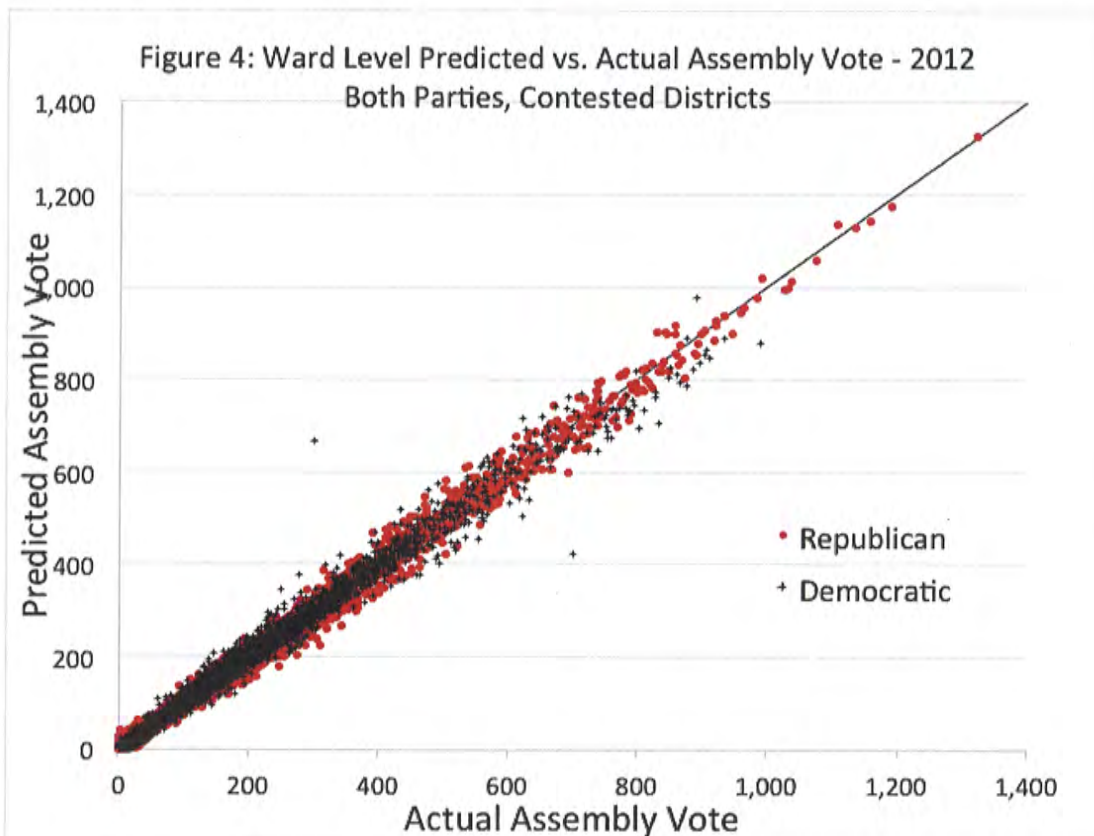
Trende's criticism on this point is utterly misinformed. No one with a solid understanding of quantitative methods or regression analysis would have made it.

IV.   Trende's Claim That My Efficiency Gap Calculations Ignore Incumbency, Candidate Quality, and Campaign Spending

In paragraphs 140-143, Trende criticizes my efficiency gap calculations for failing to take into account factors that can affect election results, such as get-out-the vote drives, candidate quality, recruitment, and campaign spending.

Trende offers no evidence that these factors would actually have a material effect on my estimates if I had more directly taken them into account. And he ignores the fact that any

estimation of the results of a hypothetical district plan utilizes baseline estimates that, in effect, average out the effects of these factors (Gelman and King 1990; 1994). That is to say, my regression model *does* implicitly incorporate these factors, in its analysis of the relationship between the presidential vote (where none of these variables will affect the vote) and the Assembly vote (where they are all incorporated into the estimates).

Moreover, Trende's criticism overlooks the point that my model is based on precisely the same information that the authors of Act 43 considered in estimating the likely partisan effects of the new districts. In particular, Gaddie's analysis of the partisan effects in the new Act 43 districts was functionally equivalent to mine and based on exactly the same considerations.

Like his complaints about alleged bias in the regression analysis that I discuss above, Trende's criticism is uninformed and betrays a lack of knowledge of how hypothetical district plans are evaluated.

V.   Goedert's Claim That My Efficiency Gap Calculations Incorporate Information Not Available to Act 43's Designers, and Ignore the Effects of Incumbency

Goedert criticizes my analysis for incorporating information that map drawers did not have (2012 election results), and for ignoring information that map drawers would have taken into account (incumbency in particular).

The first criticism is incorrect, as Act 43's designers in fact had information functionally equivalent to the 2012 election results in their possession, in the form of Gaddie's Act 43 district level estimates. These estimates, like my own, are baseline measures of partisanship, and they correlate almost perfectly with my results (r^2=0.96). In his deposition, Gaddie described in detail his method, which like mine assumed that all seats would be contested and that no incumbents would run (Gaddie Deposition, pp. 197, 198, 201, 202, 204):

> Let's suppose we have a seat with an incumbent and a seat without an incumbent and each one has an Assembly election. The party of the incumbent is presumably going to do a little stronger in the district where they have an incumbent than in an open seat. So I can't really take -- Let's suppose I move precincts from the open seat into that incumbent seat. I can't really take those open seat Assembly votes, add them, compare them to the percentage for the incumbent running for the same party, get an accurate estimation of the partisanship and the competitiveness of the district. So we attempt to create a substitute measure. Statewide elections are held in all precincts, they're held in all constituencies, so one thing that we often do is we do what we call reconstituted elections, or proxy elections, where we'll take one election or a composite of elections, like I described previously, and attempt to create some measure of partisan competitiveness, an expected vote or what we call a normal vote, what the vote would usually do without an incumbent in the district." (Gaddie Deposition, pp. 204-5)

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To highlight the similarity between Gaddie's pre-2012 estimates and my own estimates using 2012 election results, below is a graph plotting the two sets of data (Figure 7 in my original report, p. 30):

Figure 7
Gaddie and Mayer Partisan Baselne Metrics Compared for
Act 43 Districts
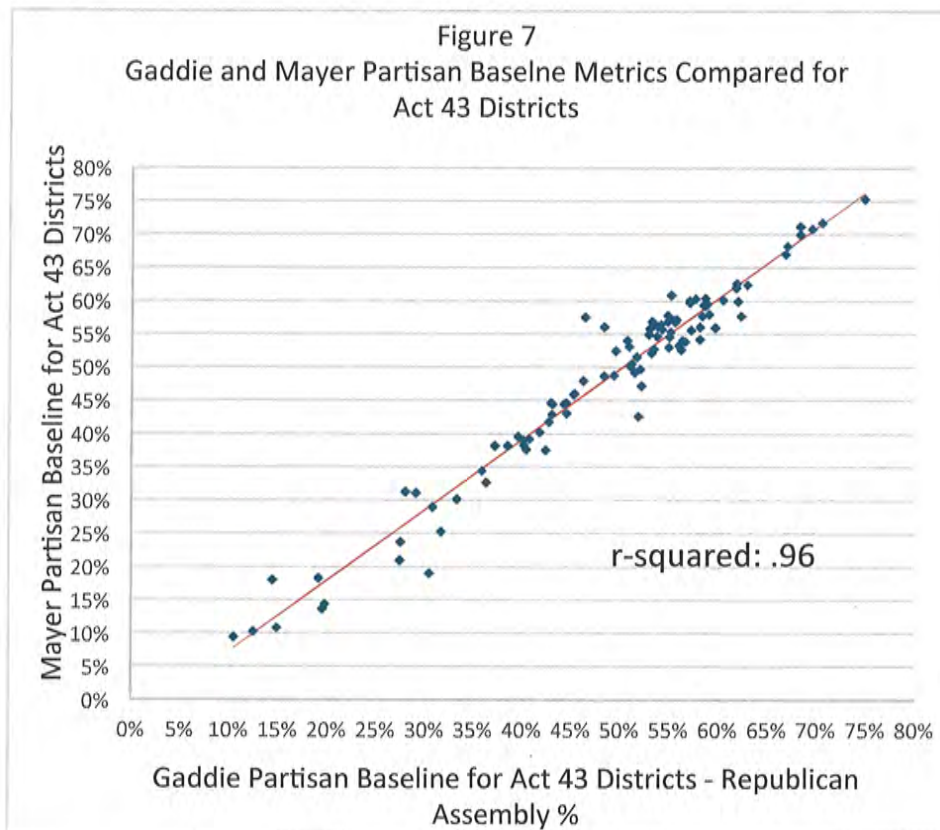
This graph shows that the information the Act 43 authors relied on when drawing their map (the Gaddie estimates) and my estimates, are nearly identical. This is largely because they are both estimates of the same underlying quantity – the baseline partisanship of a hypothetical Assembly district. Goedert dismisses the nearly perfect correlation as "mostly coincidental" (p. 17), but offers no analysis or data to support this conclusion. It is simply an assertion offered without evidence.

And it is an entirely unpersuasive assertion for the additional reason that election results in Wisconsin (and in most states) are extremely highly correlated from one election to the next. For example, Wisconsin's counties remained geographically constant between 2008 and 2012, and Trende supplied information about the presidential vote in each county in each of these years. The 2008 county level presidential vote and the 2012 county level presidential vote are almost perfectly correlated (r^2=0.96), indicating that it would make no difference whether Act 43 was assessed using the former or the latter.[12] Either way, the same conclusion would follow: that

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[12] Ward level 2008 and 2012 results cannot easily be compared because ward boundaries were redrawn after the 2010 Census.

the map is an extreme Republican gerrymander, and that the authors of Act 43 had information in their possession that predicted it.

Second, Goedert claims that map drawers do not ignore incumbency when drawing maps. That will generally be true when map drawers are trying to figure out which incumbent should be included in which district. But when it comes to estimating the likely partisanship of the new districts, ignoring incumbency (that is, controlling for it) is precisely what the drawers of Act 43 did, as Gaddie noted in his description of his methods. This approach is sensible since incumbents can be defeated, retire, run for higher office, or switch parties over a plan's decade-long lifespan. A map's authors will typically want to ensure that their projections do not depend on particular incumbents continuing to run in particular districts.

In any event, *including* incumbency in no way changes my substantive conclusions about Act 43 or the Demonstration Plan. I recalculated the efficiency gap for both maps, using my baseline partisan estimate and then incorporating incumbency into the model. For Act 43, I used the actual incumbents who ran in the plan's districts, with the adjustments noted in my report to account for paired incumbents and those who lost in primaries (p. 18, footnote 14).[13] For my plan, I geocoded incumbents' home addresses[14] and then identified which districts had incumbents residing in them using Maptitude for Redistricting. Table E shows the resulting efficiency gap calculations, and compares them to the open seat baseline I generated in my report:

	Demonstration Plan	Act 43
Table E **Efficiency Gap Calculations** **with Incumbents**		
Baseline Efficiency Gap	2.20%	11.69%
Efficiency Gap with Incumbency	3.71%	13.04%

The efficiency gap increases marginally for both plans (by 1.5% for the Demonstration Plan and 1.4% for Act 43), in large part because there were more Republican (50) than

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[13] I recalculated vote estimates using predicted values of Democratic and Republican Assembly votes when one of the parties had an incumbent running.

[14] This information was provided to me by counsel.

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Democratic (24) incumbents running in 2012. With twice as many incumbents, Republicans will win more seats than in the open seat baseline even though the Republican vote percentage remains below 50% in both cases. It is thus apparent that taking incumbency into account has no effect on my conclusion that Act 43 was an egregious partisan gerrymander; the substantive inferences are identical, with or without incumbency.[15]

VI. Goedert's Claim That I Did Not Perform Sensitivity Testing for Act 43's or the Demonstration Plan's Efficiency Gaps

Goedert criticizes the efficiency gap calculations for both Act 43 and the Demonstration Plan, arguing that I "provide no estimates for the efficiency gap of the demonstration plan under the range of plausible election outcomes facing legislators at the time they were drawing the map" (p. 16), and that I conduct no "sensitivity testing" of my calculations of Act 43's efficiency gap.

I note that Goedert has not provided any actual analysis showing that this sensitivity testing would have materially altered my conclusions, or even any citations showing that such testing is necessary to evaluate the adequacy of my calculations.

Still, it is possible to show that my calculations are robust to significant changes in the electoral environment. Using Jackman's historical estimates of the statewide Assembly vote in Wisconsin, I can determine the plausible variation of the overall vote over the course of a decade. Since 1992, the statewide Democratic percentage of the Assembly vote has ranged from a high of 54.6% (in 2006) to a low of 46.4% (in 2010). The Democratic share of the statewide vote in 2012 was 51.2% in my baseline calculations, which suggests a plausible range of -5% to +3% in conducting a sensitivity analysis. In effect, this approach asks whether Act 43's and the Demonstration Plan's efficiency gaps would be durable in the face of massive Democratic *or* Republican waves – an extremely rigorous test that exceeds what is normally found in the literature.

Following Goedert's method of applying a uniform swing (p.21), I can estimate the effects that these swings will have on the efficiency gap, both for Act 43 and for the Demonstration Plan. To maintain consistency and to address his concern that I did not incorporate incumbency in my baseline, I estimate the effects using the incumbent baseline (that is, including the incumbents who ran in 2012).

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[15] We can use these calculations to determine how many more Democratic legislators would have been elected in 2012 if either the Demonstration Plan, or a plan with an efficiency gap of exactly zero, had been in place. Under the open-seat baseline, 9.49% more Democrats would have been elected under the Demonstration Plan (11.69% - 2.20%), and 11.69% more under a plan with an efficiency gap of exactly zero. Similarly, under the incumbent baseline, 9.33% more Democrats would have been elected under the Demonstration Plan (13.04% - 3.71%), and 13.04% more under a plan with an efficiency gap of exactly zero. In all cases, these are very large differences, amounting to anywhere from nine to thirteen Assembly seats.

The results are shown in the following two tables, the first for the Demonstration Plan (Table F), and the second for Act 43 (Table G). For the Demonstration Plan, the efficiency gap remains well below the plaintiffs' suggested 7% threshold, even when the statewide vote reaches the most extreme values either party has seen over the last three decades. Specifically, the efficiency gap goes to 3.9% in the event of a Democratic wave akin to that of 2006, and to -2.0% if a Republican wave like that of 2010 occurs. For Act 43, however, the efficiency gap remains extremely large and above the threshold at all times, ranging from 10.7% in a Democratic wave to 8.8% in a Republican wave. Moreover, the sensitivity testing shows that even if the Democrats obtained over *54%* of the statewide Assembly vote – equal to their best performance in a generation – they *still* would not capture a majority of the Assembly, gaining only 48 seats. Act 43's gerrymandering thus effectively insulates the Republican Assembly majority from all plausible shifts in voter sentiment.

Table F Efficiency Gap Estimates, Uniform Swing Demonstration Plan			
	D Minus 5	My Plan Incumbent Baseline	D Plus 3
party split (R-D)	51-48	48-51	43-56
Rep share of Seats	52%	48%	43%
Wasted Republican Votes	737,557	659,821	659,390
Wasted Democratic Votes	681,900	765,561	769,546
Gap	(55,657)	105,740	110,156
Total Democratic Votes	1,336,168	1,484,631	1,573,709
Total Republican Votes	1,502,745	1,366,132	1,284,164
Total Votes	2,838,913	2,850,763	2,857,873
Efficiency Gap (gap/total votes)	-1.96%	3.71%	3.85%

	Table G Efficiency Gap Estimates, Uniform Swing Act 43 Districts		
	D Minus 5	Act 43 Actual	D Plus 3
Party Split (R-D)	64-35	60-39	51-48
Rep share of Seats	65%	61%	52%
Wasted Republican Votes	585,668	504,553	560,840
Wasted Democratic Votes	835,968	876,153	866,725
Gap	250,300	371,600	305,885
Total Democratic Votes	1,316,158	1,462,397	1,550,141
Total Republican Votes	1,527,115	1,388,286	1,304,989
Total Votes	2,843,273	2,850,684	2,855,130
Efficiency Gap (gap/total votes)	8.80%	13.04%	10.71%

Figure E below shows these results graphically: the red x's are the efficiency gap estimates for the Demonstration Plan, and the blue diamonds the estimates for Act 43. The dotted line is at plaintiffs' suggested threshold of 7%. The figure clearly demonstrates that even across huge partisan swings, the efficiency gap under Act 43 remains very large, and the efficiency gap for the Demonstration Plan remains very small. This is further powerful confirmation of the durability of Act 43's bias – and the durable *lack* of bias of the Demonstration Plan.

Figure E: Sensitivity Analysis
-5 to +3 Democratic Swing

* Demonstration Plan   • Act 43 Districts
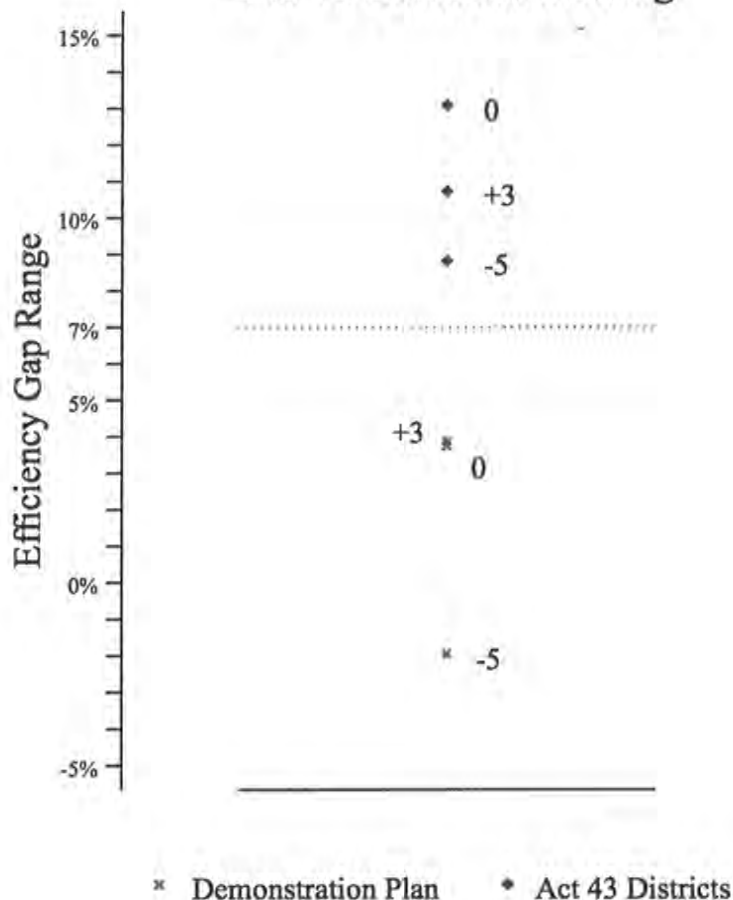
VII.   **Conclusion**

In their criticism of my report, both Trende and Goedert offer nothing but supposition, speculation, irrelevant discourse about Wisconsin political history, extraneous discussion of congressional redistricting in other parts of the United States, wildly inapposite and inaccurate conjecture about the geographic concentration of Democrats as a possible source of the pro-Republican bias of Act 43, unreliable methodologies, and minor quibbles that have no consequences for my conclusions. Neither Trende nor Goedert has conducted any valid analysis of either Act 43 or the Demonstration Plan – in fact, they make no mention at all of the specifics of the Demonstration plan.

Most significantly, nothing in their reports undercuts my fundamental conclusion that Act 43 constituted an egregious and durable gerrymander, and that it was entirely possible to draw a neutral map that met or exceeded Act 43 on all legal dimensions. If anything, the sensitivity

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testing substantially bolsters this conclusion, since it shows that Act 43's large efficiency gap and the Demonstration Plan's small one are durable in the face of enormous changes in Wisconsin's electoral environment.

Dated: December 21, 2015

/s/ Kenneth R. Mayer

Kenneth R. Mayer, Ph.D.

Department of Political Science

University of Wisconsin-Madison

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From: **Nicholas Stephanopoulos** nicholas.stephanopoulos@gmail.com
Subject: Spatial analysis sources
Date: Tue Dec 08 2015 23:59:20 GMT+0530 (IST)
To: Consulting krmayerconsulting@gmail.com
Cc: Peter Earle peter@earle-law.com, Paul Strauss Pstrauss@clccrul.org, Ruth Greenwood
rgreenwood@clccrul.org

N

Ken,

Here are some sources you may wish to consult as you do your spatial clustering analysis:

- Cho, Contagion Effects and Ethnic Contribution Networks (a fairly recent article discussing and calculating Global Moran's I).
- Chung & Brown, Racial/Ethnic Residential Sorting in Spatial Context: Testing the Explanatory Frameworks (same, and also discussing and calculating Local Moran's I).
- Glaeser, Myths and Realities of American Political Geography (calculating segregation scores over time for Democrats and Republicans)
- Massey & Denton, Hypersegregation in U.S. Metropolitan Areas (a classic sociology article laying out various definitions of segregation)
- Reardon & Sullivan, Measures of Spatial Segregation (another major sociology article discussing spatial segregation measures)

It also occurs to me, based on the last three sources, that you should calculate the isolation index for Democratic and Republican voters in 2012, using your ward-level imputed results. The isolation index is very easy to calculate in Stata using this module.

Nick

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Nicholas O. Stephanopoulos
Assistant Professor of Law
University of Chicago Law School
nsteph@uchicago.edu
(773) 702-4226
http://www.law.uchicago.edu/faculty/stephanopoulos

Attachments:
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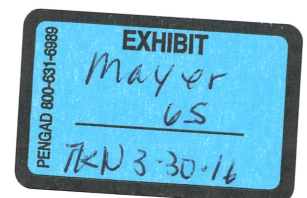
MYTHS AND REALITIES OF

AMERICAN POLITICAL GEOGRAPHY

By

Edward L. Glaeser[*]
Harvard University and NBER

And

Bryce A. Ward
Harvard University

November 23, 2005

Abstract

The division of America into red states and blue states misleadingly suggests that states are split into two camps, but along most dimensions, like political orientation, states are on a continuum. By historical standards, the number of swing states is not particularly low, and America's cultural divisions are not increasing. But despite the flaws of the red state/blue state framework, it does contain two profound truths. First, the heterogeneity of beliefs and attitudes across the United States is enormous and has always been so. Second, political divisions are becoming increasingly religious and cultural. The rise of religious politics is not without precedent, but rather returns us to the pre-New Deal norm. Religious political divisions are so common because religious groups provide politicians the opportunity to send targeted messages that excite their base.

In the aftermath of the 2000 election, David Brooks wrote in the *Atlantic Monthly* that America was split into red states and blue states. In red states, people believed in God, watched NASCAR and voted for George W. Bush. In blue states, people ate Thai food, cared about the environment and voted for Albert Gore. The 2004 election, which seemed geographically to be a replay of 2000, only reinforced the perceived value of this framework. Only three states (Iowa, New Hampshire and New Mexico) switched parties between the elections.

In this essay, we revisit America's political geography and ask what is true and false about the "red state/blue state" framework. We begin by identifying five myths associated with this framework: 1) American is divided into two politically homogenous regions; 2) The two parties are more spatially segregated than in the past; 3) America's political geography is more stable than in the past; 4) America's cultural divisions are increasing and 5) America is becoming more politically polarized.

But despite the myths surrounding the red state/blue state paradigm, there are two important truths captured by this framework. America is a country with remarkable geographic diversity in its habits and beliefs. People in different states have wildly different views about religion, homosexuality, AIDS, military policy and wildly different consumption patterns. The distribution of states along all dimensions is continuous, not bimodal, but this continuum should never be confused with homogeneity. Moreover, America's ideological diversity is not particularly new. In the 1930s, New England was much more socially liberal than the South. The extent and permanence of cultural divisions across space is one of America's most remarkable features. While spatial sorting on the basis of income or tastes may seem natural to most economists, the remarkable spatial heterogeneity of beliefs – political and otherwise – presents more of a challenge to the standard Bayesian models of belief formation. For example, in the April 2004, CBS/New York Times poll, twenty-three percent of respondents in Oregon, Washington and California thought that Saddam Hussein was personally involved in the September 11, 2001, attacks. Forty-seven percent of respondents in Texas, Oklahoma and Arkansas had that view. In the 1987-2003 PEW Values surveys, 56 percent of

Mississippi residents think that AIDS is God's punishment for immoral sexual behavior. Only 16 percent of Rhode Island residents share that view.

Using state and county level regressions, we explore a number of different hypotheses about the long run historical causes of differences in beliefs over space. We find little support these cultural differences represent long-standing differences in religiosity or the legacy of slavery.

Instead, our regressions support the idea that Blue State culture reflects primarily the legacy of different ethnicities working together at high densities: the most important historical explanatory variables are the share of the labor force in manufacturing in 1920 and the share of the population that was foreign born in 1920 strongly predict liberal beliefs and voting for John Kerry. We interpret these results as suggesting that the liberal views that reduced traditional social divisions came about because there were gains to reducing economic and religious conflicts that could derail interactions in the marketplace.

The second important truth captured by the red state/blue state framework is that political parties and politicians have had an increasing tendency to divide on cultural and religious issues rather than on economic differences. Again, in historical perspective, cultural politics is not unusual. In the late 19th century, "Rum, Romanism and rebellion" were the core issues that determined the Republican Party. The true aberration was the mid-twentieth century era of economic politics.

Why has culture dominated politics so much more effectively than economics during much of American history? Glaeser, Ponzetto and Shapiro (2005), following Downs (1957), present a model where extremism occurs because political divisions are needed to mobilize infra-marginal voters, but going to extremes is only rational when political messages are heard disproportionately by your own supporters. Political divisions therefore follow social cleavages because social organizations allow politicians to send targeted messages. .This models helps us to understand why economic divisions between

the parties only became entrenched in the middle 20th century, with the rise of the labor movement and its growing connection to the Democratic Party, and why as unions have lost their importance, religion has again come to dominate political debate.

Myths of American Political Geography

We now discuss five myths of American political geography.

Myth # 1: America is divided into two politically homogeneous areas

Does the red state/blue state paradigm that describes the remarkable spatial configuration of Democrats on the coast and Republicans in the heartland mean that Americans are increasingly living in politically homogenous states, so that a smaller number of people live in swing states? Is it true, as E. J. Dionne (2003) asserted, that "the red states get redder, the blue states get bluer," and as a result elections are being decided by a smaller and smaller number of battleground states?

Figure 1 shows the time series of the share of electoral votes in "battleground" states, where we define battlegrounds as those states with margin of victory that was less than ten percent. Alternative definitions from five to twenty percent margins of victory show similar results. The dotted line shows the share of electoral votes in battleground states in every election from 1840 until today. The black line shows the average of the past five elections. The gray line at the bottom of the figure shows the popular vote "margin of victory" in the last election.

The election-by-election results show that there is a great deal of volatility in the share of electoral votes, or population, connected with battleground states. In close elections, such as 1960, 1968 and 1976, more than 70 percent of the electoral votes were cast in battlegrounds. In blowout elections, like 1964 or 1972, less than fifteen percent of the votes are in such states. In the last three elections, between 40 and 50 percent of the

electoral votes were in swing states. These numbers lie between the high and low extremes of the last 40 years.

To show any trends that underlie this volatility, the black line in Figure 1 displays the twenty year moving average of the share of electoral votes in battleground states. The moving average shows no evidence of a general downward trend in the number of swing states. Instead, the time series suggests three periods in post-1840 U.S. electoral history. Between 1840 and 1900, on average, around 55 percent of the electoral votes lived in swing states. Between 1904 and 1948, around 30 percent of electoral votes were in swing states. After 1952, the U.S. has reverted to pre-1900 patterns. The first half of the 20th century, not today, had an unusual abundance of landslide states.

Myth # 2: The two parties are more spatially segregated than in the past

Even though the number of states that can by considered "safe" for either party has not been rising over time, there could be more political segregation at the local level. However, the county-level evidence shows that segregation by party is not significantly increasing, and it is in fact much lower than many other forms of segregation.

There are two usual indices of racial segregation that can also be used to measure political segregation: dissimilarity and isolation. The dissimilarity index measures the share of the total population of either group 1 or group 2 that would need to be moved across areas for there to be an equal proportion of group 1 in every area.[1] A high dissimilarity index indicates a large degree of segregation; if a large share of the population must move in order to be evenly distributed, then the population must currently be highly segregated. The isolation index measures the share of the population belonging to group 1 where the average member of group 1 lives. A high isolation index

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1. The dissimilarity index between group 1 and group 2 is defined as:

$$Dissimilarity = \frac{1}{2} \sum_{All\ Areas} \left| \frac{Population_{1,Area}}{Population_{1,Total}} - \frac{Population_{2,Area}}{Population_{2,Total}} \right|$$

where refers to the population of group i for i=1 or 2 in a geographic area and refers to the total population of group i.

also indicates a large degree of segregation; if the typical member of group 1 lives in an area where the proportion of group1 greatly exceeds the proportion of group 1 in the total population, then the population is highly segregated.[2]

Following Klinkner (2004), we calculate dissimilarity indices and isolation indices for Republicans and Democrats based on voting in the last presidential election between 1840 and today.[3] In all cases, we have eliminated individuals who voted for neither Republican nor Democratic candidates. We use counties as the units of observation. Figure 2 shows the time patterns of these indices.

The dissimilarity index shows that there have been two time periods where the U.S. was unusually divided spatially: the elections of 1856 and 1860, when dissimilarity topped 40 percent and the geographically based Civil War ensued, and 1924, when dissimilarity was greater than 30 percent. Over the last 60 years, dissimilarity has generally been below 20 percent. The past four elections do show a slight upward trend, but this is nothing like the remarkable rise seen between 1916 and 1924. Moreover, this level of dissimilarity is much less than the dissimilarity of college and non-college educated adults across counties (.25) or blacks and non-blacks (.46).

The isolation measures show even less of a trend. Both Republicans and Democrats live in counties where about fifty percent of the voters share their own party. The isolation index in 2004 was 53.4 percent for Republicans and 52.6 percent for Democrats. These numbers are far lower than the Republican 1920s, when the average Republican lived in a county where 70 percent of the voters also voted for Coolidge or Hoover, or the Democratic 1930s where the average Democrat lived in a county where 60 percent of the voters supported F.D.R. There is just no sense that people are generally living in politically highly segregated counties.

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[2]   The isolation index of group 1 is defined as:

$$Isolation = \sum_{All\ Areas} \frac{Population_{1,Area}}{Population_{1,Total}} \frac{Population_{1,Area}}{Population_{1,Area} + Population_{2,Area}}$$

[3] For years prior to 1856, the segregation indices represent the segregation between Whigs and Democrats.

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Myth # 3: America's political geography is more stable than in the past

While the segregation of the political parties hasn't increased significantly, it may still be true that American political divisions are hardening, and that political patterns are becoming more permanent. As Harold Meyerson (2004) wrote in the Washington Post, "the battle lines of the cultural civil war that emerged in the 2000 contest have shown themselves to be all but permeable to even the most earthshaking events." If anything, the stability predicted by Meyerson and many others was vindicated in the 2004 election where only three states (Iowa, New Hampshire and New Mexico) changed parties. Perhaps, American politics is becoming increasingly geographically stable over time.

Indeed, the myth in this case is not the stability of political geography— political geography is quite stable— but rather that this stability is new or unusual. Figure 3 shows two measures of electoral stability over the last 150 years. The top line shows the correlation coefficient across counties between the percent supporting the Republican Party in the current election and the percent supporting the Republican Party in the previous election. The bottom line shows the share of electoral votes that changed parties since the last election.[4]

The top line shows just how stable political geography has been over the last 130 years. Between 1880 and today there has only been one period where the correlation between current and lagged percentage of Republican voters dropped significantly below 80 percent. In 1964, 1968 and 1972, the coefficient dropped wildly as the South left the Democratic Party. In historical context, this period is unusual, not the 24 years since.

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[4]In both cases, as in Figure 7 & 8 below, we deviate slightly from our usual methodology in our treatment of the 1912 election. In that year, we treat Theodore Roosevelt's progressive supporters as Republicans. Since Roosevelt was a former Republican president, albeit running for election on the Progressive ticket, his supporters do not reflect any real change in support for the Republican party, but rather a temporary deviation to supporting a Republican political idol. Without this correction, the 1912 election would display a particularly unusual degree of political fluidity as Republicans flocked to Roosevelt in 1912 and then flocked back to the Republican fold in 1916.

The correlation between the percentage of voters supporting George W. Bush in 2004 and the percentage of voters supporting Bush in 2000 at the county level is over 95 percent. This is high, but not unlike the degree of electoral stability engendered in the re-election campaigns of Eisenhower or Franklin Roosevelt. In these cases, the correlation coefficients were also in the mid-90s. Over the past 20 years, smoothing out election-by-election variation, the correlation has been lower than during 1932-1960 or 1868-1908. Stability has been the norm, not the exception, in American electoral history, and recent trends have brought us back to this norm.

Myth # 4: America's cultural divisions are increasing

A steady stream of rhetoric proclaims that "there is a religious war going on in this country, a cultural war as critical to the kind of nation we shall be as the Cold War itself, for this war is for the soul of America" (this example is from Davis and Robinson, 1997). Fiorina, Abrams, and Pope (2004) provide a rich set of examples showing that across a wide range of issues, the distribution of preferences is single-peaked: most people are in the middle of the distribution and not at the extreme. We will later disagree with Fiorina, Abrams, and Pope (2004) in our interpretation of American political geography, as we believe that there are significant cultural divisions across space and people: Mississippi is not Massachusetts. But we do not disagree with their evidence that divisions across people and space have not been increasing over time.

For example, consider polling evidence on extreme views about abortion. From 1972 to 2004, the share of the population taking the position that abortion should never be permitted has varied in a narrow band between 10-13 percent, according to data from the National Election Surveys. Conversely, the fraction of the population taking the position that abortion should never be forbidden or that a women should always be able to obtain an abortion (the precise wording of the question varied over time) rose from 25 percent in the 1970s to roughly 35 percent in the 1980s, before peaking at about 45 percent in 1992 and declining back to the 1980s levels since then. Overall, any purported increase in abortion extremism amounts to essentially no change in the share of the population who

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is extremely opposed to abortion and the share of those who believe abortion should never be forbidden fluctuating somewhat, but currently standing at the same level as the 1980s. Similarly, while many Americans are opposed to homosexuality, on the whole, Americans have become significantly more tolerant of homosexuality now then they were 20 years ago. We are not living in an era of increasing cultural divisions between people, even if politicians are increasingly dividing on these issues.

Myth # 5: America's political divisions are increasing

A final myth is that we live in an era of increasingly polarized politics, where individuals from different parties increasingly despise one another, or as Lawrence (2002) writes, "when George W. Bush took office, half the country cheered and the other half seethed." Certainly, the heat of the last election, where Democrats accused the President of trading blood for oil, and the Swift Boat Veterans for Truth attacked John Kerry's war record, does suggest rising tempers and mutual distaste.

One usual political science measure of inter-party dislike is the group "thermometer." In "thermometer" questions, respondents are asked to give their feelings towards a group on a 0 to 100 scale with 100 indicating the most positive and 0 indicating the most negative. The National Election Survey offers thermometer ratings towards the Democratic Party and the Republican Party bi-annually since 1978 (with the exception of the 2002 survey, which did not include this question). For the whole period, Democrats' thermometer rating of the Democratic Party averages 73, and their average rating of the Republican Party averages 42. Republicans, on the other hand, rate the Republican Party at an average of 70 and the Democratic Party at an average of 44.

Since these ratings may be influenced both by general attitudes towards politics and by partisanship, we compute each individual's relative taste for the Democratic Party by subtracting the thermometer rating towards the Republican Party from the thermometer rating for the Democratic Party. We then average this relative preference for the Democratic Party among Democrats and Republicans separately.

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Figure 4 shows the average relative preference for the Democratic Party among Democrats and Republicans since 1978. The difference between these two lines should be seen as widening partisan hostility. Throughout most of the past 30 years partisanship has been essentially stable, albeit with a slight upwards trend. There was a slight increase in hostility in the early Reagan years and some swings during George H.W. Bush's presidency, but from 1982-1998 partisanship is essentially flat. Moreover, between 1978 and 1998 any rise in partisanship is statistically insignificant.

After 1998 (and particularly between 2000 and 2004), there have been sharp increases in both Republican and Democratic partisanship. Republican enthusiasm for the Republican Party is higher than it has ever been. Democratic hostility for the Republican Party is higher than it has ever been. As such, there is certainly some truth to the view that we are currently experiencing a strongly partisan period, but this does not appear to represent any sort of a secular trend. This division really began in 2000 and seems to be more of a George W. Bush effect than any ongoing move towards greater partisan hostility. Of course, it remains to be seen if partisanship declines in the post-Bush era.

The First Reality of American Political Geography: Cultural Heterogeneity

These myths have led some observers to suggest that there is no truth to the "Culture War" metaphor or that the red state/blue state division is just plain false. While there are misleading elements of these frameworks, amidst all myths, these ideas also contain two great, essential truths. First, America is a nation of enormous cultural and economic diversity. This diversity is not new and it shouldn't be news, but it is still the central fact of American cultural geography. We earn, consume and believe wildly different things in different parts of this country. To an economist, perhaps the most striking thing is that beliefs can differ so much over space.

Second, American political parties have increasingly become organized around cultural and religious fissures. 30 years ago, income was a better predictor of party than religious

attendance. Today, religion rather than earnings predicts Republicanism. The rise of religious politics is not without precedent. Prior to 1930, the correlation between religion and party affiliation across states seems to have been at least as strong as it is today. Nonetheless, this cultural division is a central political fact of the last 25 years.

Heterogeneity of Economics and Society

Using the Pew Research Center's 1987-2003 Values Survey (combined dataset), we have calculated state average responses for a number of questions about values and beliefs. Even pooling over this 16 year time period, sample sizes are often modest, so we include only those states with more than 50 observations over the entire time period. In Table 1, we report the ten most extreme states (including the District of Columbia) for six of these questions. We also include the ten most extreme states in terms of median household income and wine sales per capita.[5]   Since correlations across variables are far less than one, if we followed Ansolabehere, Rodden and Snyder (2006) and look at an average variable to classify states views as unidimensional, we would miss significant amounts of the striking variation that exists across states.

The first panel shows the state average response rate to the question "Should schools fire homosexual teachers?" Across the entire sample, 42 percent answered yes to this question. There is striking geographic variation to this question. In the five most liberal states (with respect to this statement): New Jersey, Maryland, Connecticut, the District of Columbia and Massachusetts, less than 30 percent of respondents thought that teachers should be fired for being gay. In the five most conservative states: West Virginia, Oklahoma, Tennessee, Arkansas and Mississippi, a healthy majority favored firing homosexual teachers. Indeed, almost two-thirds of Mississippi respondents favored

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[5] One potential issue with a table of this nature is that these samples are not huge and we should expect to see significant variation. However, the variation across states is much higher than we would expect from random sampling error. On average, each state has 440 respondents, and if the true response probabilities were the same across states, we would expect the standard deviation of state level averages to be .023. The standard deviation of the state means is more than four times this amount. We can soundly reject the view that differences across states just reflect sampling error.

firing such teachers. The standard deviation of state mean is more than four times the standard deviation of state means that would be expected from random sampling error.

The second and third panels show similar geographic heterogeneity in the responses to the statements "It is okay for blacks and whites to date" and "AIDS is God's punishment for immoral sexual behavior." While the extreme left and ring wing states as defined by these first three questions are not the same, the correlations among them are quite high. e.g., the correlation between the belief that schools should fire homosexual teachers and approval of black-white dating is -77 percent.

Figure 5 shows that responses to these cultural statements are highly correlated across states with voting Democratic in the last election. In no state that went for Kerry did the share of respondents agreeing with the statement "AIDS is God's punishment for immoral sexual behavior" exceed 38 percent. In no state that went for Bush did the share of respondents answering no to this question fall below 28 percent. The overall correlation coefficient across states between this variable and voting is -70 percent. The figure also illustrates that there is a continuous distribution of beliefs over space, not two nations. The variation is striking, but the distribution is not bi-modal.

The fourth and fifth panels show that geographic heterogeneity in political beliefs is not limited to cultural issues, but it extends into foreign and economic policies as well. These panels indicate the share of respondents that agree with the statements "the best way to ensure peace is through military strength" and "when something is run by the government, it is usually inefficient and wasteful." The differences in the fraction who agree with these statements between the most liberal and conservatives states are 30-40 percent. Again, America is not two nations, but it does have a lot of geographic heterogeneity in its beliefs.

The heterogeneity of political beliefs is accompanied by striking geographic heterogeneity in religious beliefs. The Pew data have only a limited number of questions

on religious beliefs, such as "I never doubt the existence of God," and "Prayer is an important part of my daily life." There is geographic variation in the former question: 30 percent of Delaware respondents admit to doubt, while only four percent of South Carolina respondents admit to doubt. There is even more geographic variation in the question on prayer. In this case the range is from 58 percent in Rhode Island to 95 percent in Mississippi.

Other data sets, such as the National Election Survey and the General Social Survey, provide other, perhaps more interesting questions. For example, the National Election Survey provides us with variation in belief about the literal truth of the Bible. In this case, the most believing states were Louisiana and Alabama, where 75 and 69 percent of respondents respectively believed in the literal truth of the bible. The least two believing states were Massachusetts and Connecticut, where only 17 and 20 percent of respondents respectively believed in the literal truth of the bible. The General Social Survey provides us with belief in the existence of the devil. The General Social Survey sample is too small to make comparisons across states, but across regions the variation is significant. In the Pacific region, 49 percent of respondents say that they believe in the devil; in the East South Central region, 82 percent of respondents say that they believe in the devil.[6]

Panel 6 of Table 1, reports the extreme states measured in terms of responses to the statement, "We will all be called before God on Judgment Day to answer for our sins." The five states with the smallest fractions believing in Judgment Day are Vermont, Rhode Island, Oregon, New Hampshire and Nevada. The five states with the highest fractions are Tennessee, South Carolina, Oklahoma, Alabama and Mississippi. These numbers make it clear why a New England agnostic intellectual might indeed feel that the Deep South is another planet. After all nearly 95 percent of respondents from that state will have a fundamentally different view of God and the after-life from this New England agnostic.

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[6] The Pacific region consists of Washington, Oregon, California, Alaska, and Hawaii. The East South Central region consists of Kentucky, Tennessee, Alabama, and Mississippi.

The regional patterns on moral issues appear to be remarkably durable. Today, the New England and Mid-Atlantic regions are today America's most liberal regions (along with the Pacific Coast). These regions appear to have had liberal views as early as the 1930s. In 1936-37 Gallup polls, across the U.S., 67 percent of respondents said that they would vote for a qualified Catholic for President and 49 percent of respondents said that they would vote for a quality Jew for President. In New England and the Mid-Atlantic region, 74 and 79 percent of respondents said that they would support a qualified Catholic and 62 and 59 percent of respondents said that they would support a qualified Jew, which made these two regions the most tolerant in the county along these dimensions. They were also the most liberal regions in favoring support for federal funding of venereal disease, supporting a free press and opposing the sterilization of criminals. Importantly, in those days, New England had the most conservative views on economic policy.

One of the peculiarities of American geography is that ardent Christianity and belief in the military tend to go together. Across states, the correlation between the share of respondents who say that prayer is an important part of my daily life and the share of respondents who say that the best way to ensure peace is through military strength is 73 percent. One can certainly interpret the Gospels as having an anti-military message, but this doesn't seem to be the interpretation favored by America's most active Christians.

The country doesn't just display remarkable difference in beliefs about religious things like the devil; beliefs about foreign policy related facts also differ significantly across space. For example, a CBS/New York Times poll of April 2004 asked respondents, "Do you think Sadam Hussein was personally involved in the September 11, 2001, terrorist attacks on the World Trade Center?" 45 percent of the South Central region respondents said yes to this question, but only 25 percent of the Pacific Southwest respondents shared this belief. In the same poll, 60 percent of the South Central region respondents and 62 percent of the Mountains and Plains respondents said that they think that "Iraq probably does have weapons of mass destruction that the United States has not found yet?" Only

forty-three percent of the Pacific Southwest and forty percent of the Pacific Northwest respondents shared this view.[7]

These differences in beliefs within the U.S. drive home one central point about human cognition: the Bayesian approach to learning offers little hope for understanding the remarkable heterogeneity in beliefs across individuals and space (Glaeser 2004). In these rational models, disagreement is difficult, let alone the wild level of dispersion of beliefs that we see. After all, there is no real difference in the evidence that these different states have been exposed to, yet they have come to radically different conclusions, and continue to hold these conclusions despite being aware that others disagree. Despite Aumann (1976), Americans wholeheartedly agree-to-disagree. One natural alternative model is that people base opinions mostly on the views of those around them. As such, local interactions are critical, and these provide plenty of possibility for wide geographic variation (as in Glaeser, Sacerdote and Scheinkman, 1996).

Of course, the nation is different in many other ways as well. According to 2003 Census Bureau figures, the five wealthiest states (Minnesota, Virginia, Connecticut, New Hampshire and New Jersey) had median family incomes around $55,000. Mississippi, Arkansas, West Virginia and Louisiana all have median family incomes that are $20,000 less than this amount. Of course, these are nominal income levels, uncorrected for state cost of living, but certainly the ability to buy traded goods is far lower in these poorer states. Unsurprisingly, there is a healthy correlation between attitudes and income. The correlation between mean income and acceptance of black-white dating is 58 percent. The correlation between income and the belief that homosexual teachers should be fired is -68 percent. A particularly surprising relationship is the fact that the correlation between state median income and share of respondents that say that poor people have become too dependent on government assistance is -38 percent. As we will discuss later,

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[7] The Pacific Southwest includes California, Nevada, Arizona, and Hawaii. The Pacific Northwest includes Alaska, Washington, Oregon, and Idaho. The South Central includes Texas, Oklahoma, Arkansas, Louisiana, and New Mexico. The Mountains and Plains include Colorado, Utah, Wyoming, Montana, North Dakota, and South Dakota.

the fact that respondents in poorer states are more likely to have anti-redistribution opinions makes us doubt whether these opinions should be seen as being exogenous variables that reflect true economic interests. Another quite plausible view is that these opinions are the result of political affiliation and the desire to be consistent with the party line.

While there is a positive correlation between voting Republican and the share of respondents that say that poor people have become too dependent on government, the correlation between state income and Republicanism is -43 percent. Since individual level income still positively predicts voting Republican (albeit weakly), the negative correlation between income and Republicanism at the state level represents one of those interesting instances in which aggregate relationships are the reverse of individual relationships (as in Glaeser and Sacerdote, 2001). This relationship, however, disappears if we control for state level cultural variables or even urbanization, and one explanation for this phenomenon is that the correlation between income and culture is much stronger at the state level than at the individual level.

Differences in consumption patterns are even greater than differences in income. The five states with the least wine sales (West Virginia, Mississippi, Oklahoma, Arkansas and Iowa) sold around 1 gallon of wine per capita in 2002. The five areas with the most wine sales (Massachusetts, Nevada, Idaho, New Hampshire and the District of Columbia) consumed nearly five times as much wine per capita. Even wine consumption is correlated with political and social beliefs, often in surprising ways. For example, the correlation between wine consumption and the share of respondents who think that black-white dating is okay is 61 percent.

While the geographic differences within America are large, they are not new and they do not seem to be growing. There is little evidence to back up E. J. Dionne's assertion that red states are getting redder and blue states are getting bluer. We compared the variance of state averages during the 1987-1993 period and the 1994-2004 period. The variance across states in the opinion that schools should fire homosexual teachers has risen

slightly. The variance of the state average view that it is okay for blacks and whites to date has fallen more. The variance of the view that AIDS is God's punishment has risen. The variance in the share of the population that takes the Bible to be the literal word of God has fallen. The variance of the share that thinks that the government is often inefficient and wasteful has risen. Overall, it is hard to see a general trend. The nation is different and it has been so for many years.

The Causes of American Cultural Diversity

While the differences in political and social beliefs across space are striking and while many of these correlations are provocative, these correlations give us little idea about what factors explain differences in beliefs across the United States. In this section, we consider three possible explanations: long-standing differences in religious adherence across states, the legacy of slavery, and diversity in the marketplace. The first hypothesis suggests that the fundamental difference between areas within the U.S. is simply the degree of religiosity. The second hypothesis is that regional differences fundamentally reflect the legacy of slavery and the Civil War.

The third hypothesis – diversity in marketplace-- suggests that areas where diverse populations interacted in market settings developed beliefs that reduced ethnic and religious conflict. According to this view, if ethnic groups interact at high densities, they either destroy each other or eventually develop ideologies that minimize conflict.[8] While many of the "liberal" responses to survey questions suggest tolerance towards minorities or people who violate traditional religious norms, this hypothesis does not imply that blue state America is tolerant and Red State America is not. Blue State America is more intolerant of some groups like the religious and Southerners. Instead, this hypothesis suggests that Blue State ideology is tolerant in ways that reduced the ethnic and religious conflicts that could have hurt an economy depending on ethnically diverse populations working together at high densities.

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[8] Alternatively, the hypothesis can be interpreted as suggesting a reverse causality where diverse ethnic groups economically interact only in places that have managed to reduce conflict.

To measure the historical religious environment, we use the 1926 Census of Religious Bodies which provides a count of members of different churches at both the county and state level. Because some denominations (Catholics, Lutherans, Episcopalians) include children in their membership, but most other Protestant denominations do not (or do not do so consistently), we follow Johnson, et al (1974) and multiply membership in churches which substantially underreport child participation by the total county population divided by the population over 14. Then, using the classification groupings of the American Religion Data Archive (www.thearda.com) based on the research of Steensland, et al (2000), Melton (1999) and Mead (1995), we calculate the number of church members who are evangelical.[9] The county-level correlation between adherents per capita in 1926 and adherents per capita in 1990 is .44.[10] We present the results for evangelicalism because it is both more correlated over time and more correlated with modern religious behavior

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To test whether current political divisions reflect the enduring legacy of slavery and the Civil War, we use the number of slaves per capita in the state in 1850. For places that weren't states, this variable takes on a value of zero. Because this variable is highly skewed, we use the logarithm of one plus this variable (none of our results change if we use the linear specification). Our results are also unchanged if we replace this continuous variable with a discrete variable that takes on a value of one if the state was a member of the Confederacy.

The diversity hypothesis is tested using three different measures of diverse social environments. First, using Census data we use the share of the population that is foreign born in 1920. We have reproduced our results using a fractionalization index of ethnic heterogeneity based on country of birth in the 1920 Census.[11] Second, we use the share

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[9] For a complete description of how the modern list was matched to historical denominations, see the data appendix posted at http://www.people.fas.harvard.edu/~bward

[10] We exclude 5 counties with adherents per capita well above 1 in 1926 from this correlation.

[11] The results with ethnic-fractionalization indicies which include race as well as foreign-born ancestry change the results discussed below slightly. Specifically, the significance the slavery measure increases slightly for several of the outcomes, and the significance of the log of density decreases slightly.

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of the population that worked in manufacturing in 1920. This variable is highly correlated with the density and urbanization of an area, and we see it as a proxy for high density economic interactions. We have obtained similar results using the share of the population in 1920 that lives in cities with more than 25,000 people.

Regressions (1)-(6) show our results for states and regression (7) shows the connection between these explanatory variables and the share voting for Kerry at the county level. In the state level regressions, the explanatory power is quite high and r-squareds run from 48 percent to 70 percent. In the county level regressions, the r-squared is 14 percent.

The first row shows the impact of evangelism in 1926. Evangelicalism in 1926 is statistically significant in four out of seven specifications. For example, it significantly predicts approval of black-white dating and belief in peace through strength, and it weakly predicts the belief that AIDS is a punishment from God and the importance of prayer. In most cases, the coefficients are reasonably large, but due to the high correlation of the independent variables, this variable is not highly significant. In univariate regressions, the evangelicalism variable is almost always significant.

In the second row, we see the coefficients on the slave population in 1850. In this case, the coefficients are typically small and quite insignificant. The same is true of the categorical variable depicting membership in the confederacy. There are two variables which this variable (or the confederacy variable) is correlated with – the belief in peace through strength and, somewhat surprisingly, a belief in the efficiency of government. These effects, while significant, are still quite small. While it is not impossible that the legacy of slavery matters, there is no sense that support for Republicanism is determined by the borders of the old slave states, and despite E. J. Dionne's views, there is little evidence to suggest that current political and social divisions reflect the ongoing legacy of the Civil War.

In the third row, we look at the importance of percent foreign born in 1920. In this case, the coefficients are generally significant economically and statistically. As the share of

the state that is foreign born in 1920 increases by one percentage point, the share of respondents who say that AIDS is God's punishment declines by .271 percent point and the share of respondents who say that homosexual teachers should be fired declines by .504 percentage points. Foreign born is also negatively associated with the importance of prayer and positively correlated with acceptance of interracial dating. Finally, this variable is strongly positively associated with support for the Democratic Party. As the county share foreign born in 1920 increases by one percentage point, the share supporting Kerry increases by almost one-half of a percentage point.

The fourth row examines the impact of the share of the workforce in manufacturing in 1920. In this case, the coefficients are significant in every regression except on black-white dating. Industrialization 85 years ago is an astonishingly good predictor of social and cultural attitudes today across states and a good predictor of support for the Democratic Party at both the state and county levels. As the share of the workforce in 1920 in manufacturing increases by one percentage point, the share of respondents today believing that AIDS is punishment declines by .28 percentage points, the share believing that military strength is the best way to peace declines by .16 percentage points, and the share supporting John Kerry at the state level increased by .42 percentage points.

Religious and political attitudes are better predicted by industrialization and immigration 100 years ago, then by the history of slavery and religion. Traditional religious views and voting Republican is strongly associated with places where Anglo-Americans lived with fewer immigrants. Likewise, late industrialization is also strongly associated with Republican ballots and views that are now Republican. History does matter, but it seems that cultural and political divides have at least as much to do with industrialization and immigration than with religious history or slavery.

While there are many possible explanations for the connection between immigration, industrialization and culture, one hypothesis is that diverse populations working together at high densities, eventually develop ideologies that minimize conflict. Alternatively, areas that were more productive and that sought new immigrant labor encouraged views

that minimized religious strife and encouraged financially profitable immigrants.   New York City has a remarkable history of religious tolerance dating from its founding as a commercial colony.   Its Dutch commercial leaders tolerated Jews and heterodox Christians because their presence would increase the economic welfare of the colony. Through the early 20th century, industrialists generally opposed the intolerant, nativist strain that would eventually shut off the supply of cheap immigrant labor.

New England's path to religious tolerance also shows the importance of commerce and heterogeneity. . Early seventeenth century Massachusetts is usually put forward as a model of intolerance, not openness, and Protestants of differing views were exiled (like Anne Hutchison) or killed (like Quakers). However, by the 19th century, tolerant Unitarianism had replaced strict Congregationalism, and as we have already discussed in the first decades of the 20th century, New England was remarkably socially liberal.

The change appears to have begun even at the end of the eighteenth century, as "merchants increasingly were dependent on their commerce with the outside world and believed in seeking an accommodation with that world" (Bremer, 1995, p. 173). Between 1690 and 1710, traditional Puritanism declined. The state legislature pushed Increase Mather, a champion of traditional Puritanism, out as President of Harvard. Merchants, like Thomas Brattle, endowed more liberal churches, and, in 1699, the "Brattle Street Manifesto" affirmed a far more tolerant form of Congregationalism. The decline of strict Puritanism appears to have been primarily the result of actions by merchants like Brattle and Elisha Cooke who followed the merchant led community in New York towards a more religiously tolerant and less religious community (the stricter Congregationalists of course founded a competing college in New Haven).

This hypothesis does not mean to suggest that diversity always leads to tolerance. Indeed, in many cases, diversity leads at least initially to hatred and ethnic conflict (Glaeser, 2005). However, if different religious or ethnic groups are prevented from using the power of the state to disenfranchise, enslave or kill each other, and if there

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exists a powerful group that benefits from eliminating conflict, then diversity can eventually lead to a watering down of core religious tenets or ethnic animosities.

The Second Reality of American Political Geography: Politics follows Culture

Around the 2004 election, many authors commented on the remarkable correlation between the tendency to go to church and the tendency to vote Republican. The overall correlation between income and Republicanism among white males is essentially zero outside of the extremes of the income distribution (Glaeser, Ponzetto and Shapiro, 2005). However, the relationship between Religion and Republicanism is extremely strong throughout the distribution. Individuals who go to church once a month vote Republican 66 percent of the time; individuals who go to church once per week vote Republican 75 percent of the time. The correlation between the church attendance variable and Republicanism is 20 percent.

This increasing importance of religion does represent a shift over the past 50 years. Figure 7 shows the impact of income and religion over the past 50 years. The vertical axis depicts the OLS coefficients from estimation of the following equation for each election year:

(1) $\text{Pr(Republican)}_i = \beta \bullet \ln(\text{Income}_i) + \delta \bullet \text{church attendance}_i + X_i'\varphi + \varepsilon_{i,,}$

where Pr(Republican) is a categorical variable taking on a value of one if the individual votes republican, $\ln(\text{Income}_i)$ is the logarithm of family income, church attendance is a categorical variable taking on a value of one if the individual attends church once per month or more. The X vector includes controls for gender, race, education and age. As before, we have excluded voters who chose neither Republicans nor Democrats. The black line shows the effect of log of income, and the grey line the effect of attending church once a month or more. The coding of religion in the National Election Survey changed in 1972, so it is inappropriate to compare the magnitude of effects before that

date with the magnitudes after then.[12] The figure suggests that in the 1970s and before, the coefficients on income and church attendance were comparable. Since 1980, religion has become much more important.

To analyze longer historical patterns in the relationship between income and Republicanism, we turn to county level election returns and during each election from 1864 until today we regress:

$$(2) \quad \frac{\text{Republican Votes}}{\text{Total Votes}} = \alpha + \beta \bullet \text{Log(Median Income in 1950)} + \varepsilon$$

where α is a constant and β captures the relationship between Republicanism and income. We use income in 1950 because income is not available before 1947 and we wanted to be able to use a consistent measure of county wealth. Results look similar if we use the logarithm of contemporary income for the post-1950 period. Because of the correlation between income and the South, we also present estimates of β in regressions that include a dummy variable indicating that the state was a member of the Confederacy and in regressions excluding all of those states.

The top line shows the estimates from a regression with no Confederacy control and that regression shows a straightforward rise and decline in the connection between income and Republicanism. The most basic fact is that from the 1870s to the 1950s, richer states were reliably more Republican and this is no longer true today. On average, a one log point increase in 1950 median income (roughly a doubling) generally increased the share of the population that voted Republican by 4 percent between 1868 and 1956. The bottom line excludes the south, and in this case, there is a very long term pattern (1870-2004) and a recent pattern (1976-2004) of declining correlations between income and Republicanism, but over in the middle part of the 20th century, there is extreme volatility

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[12] Prior to 1972, the church dummy is equal to one if the respondent attends church often or regularly. The fraction of respondents in these categories in 1968 (the last year it was phrased in this way) is basically the same as the fraction attending church at least once a month in 1970 (the first year of the new version).

in the income-Republicanism relationship mostly associated with the ability of
Democrats to attract high income urban counties. Finally, the middle line shows an even
more complex pattern, but one that still supports a declining relationship between income
and voting Republican at the county level.

Our results contrast with those presented by Ansolabehere, Rodden and Snyder (2006)
who argue that economics remains a more important predictor of political orientation
than morals. Our results differ because they use opinions on issues to predict voting and
we use actual income and religious attendance. Income doesn't strongly predict voting
Republican but their economic issues index does. On moral issues both opinions and
harder variables like church attendance predict Republicanism.

To believe Ansolabehere, Rodden and Snyder's (2006) view that economic issues
continue to trump moral issues, you must believe that the importance of economic voting
should be measured by using opinion surveys about economics rather than actual income.
If these survey opinions are the result of political affiliation rather than the cause (either
because of social persuasion as in Murphy and Shleifer, 2004, or because of a desire for
internal consistency), then it would make little sense to regress voting on opinions. The
first reason to question the use of these surveys is that responses are weakly correlated
with individual economic status and correlations at the state level generally go in the
wrong direction. Economic opinions don't appear to respond to economic interests.

A second issue with the Ansolabehere, Rodden and Snyder (2006) economic issues index
is that this index is the result of factor analysis designed to find opinions that tend to go
together. The opinions that go together and are labeled "economic issues" are an odd mix
including enthusiasm for government spending, environmentalism, health insurance and
labor unions. These views have little in common other than being major parts of the
Democratic platform, and one plausible interpretation of the factor analysis is that instead
of finding exogenous preferences for economic policy, they have identified the common
factor that is ideological loyalty to the Democratic Party.

A third reason to be suspicious of economic opinions is the pattern of regional change, especially relative to the persistence of moral opinions (New England was liberal on religious issues in the 1930s and remains so today). In the 1930s, Republican New England was anti-government and pro-free market and the Democratic South was strongly pro-redistribution. These opinions have completely flipped as party affiliations have flipped. There is no sense that the changing patterns reflect changing economic fortunes, because after all, these opinions remain negatively correlated with economic realities. As such, we think that it is more sensible to look at hard variables that capture economics and religion, like income and church attendance, and these variables show a steady increase in the correlation between religiosity and Republicanism relative to the constant correlation or declining correlation between Republicanism and income.

If the correlations between economics and Republicanism are open to debate, there is little doubt the religiosity increasingly predicts voting Republican. This voting pattern is is mirrored by changes in party policies and party platforms. Glaeser, Ponzetto and Shapiro (2005) compare the party platforms of Republicans and Democrats in 1976 and 2004. During the earlier time period, the Democratic platform took a truly moderate stance, recognizing the differing views of many Americans, but finding it "undesirable to attempt to amend the U.S. constitution to overturn the Supreme Court decision in this area." In that platform, the Democratic platform supported "the Congressional efforts to restrict the use of taxpayers' dollars for abortion." In 2004, far from considering a pro-life Amendment, the Democratic Party stood "proudly for a women's right to choose, consistent with Roe v. Wade, and regardless of her ability to pay." The Republican platform similarly trended right and in 2004 stated that "the unborn child has a fundamental individual right to life that cannot be infringed." Interestingly, political rhetoric was matched with little visible action; there is no difference in the number of abortions per capita under Democratic and Republican presidencies (Glaeser, Ponzetto and Shapiro, 2005).

The abortion gap between the parties is mirrored by gaps in many religious or cultural policies. The Republican platform also opposes gay marriage and embryonic stem cell

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research. Democrats have clearly taken opposing positions on these and similar issues. By contrast, in the debate over the Iraq war, John Kerry claimed to differ primarily in his competence and ability to bring in allies, not in his commitment to fighting America's enemies. In the economic sphere, both party platforms trumpet their commitment to reducing taxes (Glaeser, Ponzetto and Shapiro, 2005). The starkest differences in both public statements of candidates and in the wording of the platforms occur along moral dimensions. Given the statements of party platforms, it is no surprise then that religion predicts party preference better than income.

The recent rise in the connection between politics and religion hardly represents something new in American politics. In the pre-modern era, religion was also a central part of party politics. . Party platforms during the nineteenth century also often contained significant religious or cultural statements. For example in 1880, the Republican Party platform attacked Catholic education by endorsing a constitutional amendment "to forbid the appropriation of public funds to the support of sectarian schools." In 1884, the platform resolved "that it is the duty of Congress to enact such laws as shall promptly and effectually suppress the system of polygamy within our Territories; and divorce the political from the ecclesiastical power of the so-called Mormon Church." In 1888, the platform contained a moderate pro-prohibition plank supporting "all wise and well-directed efforts for the promotion of temperance and morality." Fifty years later, the Democratic platform called for a repeal of prohibition.

The relatively mild language of the platforms was coupled with stump speeches which emphasized cultural or religious divisions. Following Samuel Burchard in 1884, Republicans accused Democrats of standing for "Rum, Romanism and Rebellion." By contrast, the Democrats relied upon their urban support from Catholic immigrants from Ireland and Germany. Indeed, the roots of the Republican Party are in the religion-inspired battle against slavery. Protestant ministers like Henry Ward Beecher (whose sister wrote *Uncle Tom's Cabin*) fervently supported the Republican Party before the Civil War.

However, while these anecdotes certainly suggest that it was possible that religion mattered as much in the past as it does today, it provides us with no quantitative evidence on this topic. To analyze historical patterns, we turn to county level election returns and during each election from 1864 until today we regress:

$$(3) \quad \frac{\text{Republican Votes}}{\text{Total Votes}} = \alpha + \beta \bullet \frac{\text{Adherents in a Set of Denominations}}{\text{Total Church Adherents}} + \varepsilon$$

where α is a constant and β now captures the relationship between Republicanism and religious affiliation. In this case, we present results with and without the variable capturing membership in the Confederacy. We use two different religion variables: the share of church members that are evangelicals and the share of church members that are mainline Protestants. Catholics represent the main excluded category. We use religious censuses from 1890, 1926, 1952 and 1990, and in all cases, we used the data from the chronologically closest religious census. Given the extremely high persistence of denomination over time (the 80+ percent correlation between evangelicalism in 1926 and 1990), these results are not particularly sensitive to using religion measures from other years. Mainline Protestants primarily include Presbyterians, Episcopalians, Lutherans, and Methodists, while evangelicals are more conservative and include a wide array of groups like Southern Baptists and Pentecostals.[13] Again, we use the American Religion Data Archive (www.thearda.com) classification.

Figure 8 shows our results where the data is smoothed by averaging the estimates of β over three elections and graphing the results. We again treat votes for Theodore Roosevelt in 1912 as votes for the Republican Party in that year. There are obviously many different ways of performing this exercise, but this provides a simple sense of the

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[13] Steensland, et al (2000) provide a basic description of the major differences between Mainlines and Evangelicals: "Mainline denominations have typically emphasized an accommodating stance toward modernity, a proactive view on issues of social and economic justice, and pluralism in their tolerance of varied individual beliefs. Evangelical denominations have typically sought more separation from the broader culture, emphasized missionary activity and individual conversion, and taught strict adherence to particular religious doctrines."

correlates of Republicanism, at least at the county level, in the time period before opinion polling.

The bottom line charts the changing relationship between the Republican Party and evangelicals. During the early time period, even controlling for being a Southern county, evangelical counties were much more likely to be Democratic than to be Republican. Over the last 25 years that has changed, and today there is a significant positive relationship between the share of the religious population that is evangelical and the share of the population that voted for George Bush. As the share of the population that is evangelical increases by one percentage point, the share voting Republican increases by .13 percentage points.

But the graph makes it clear that while the connection between Republicanism and evangelicalism may be new, the connection between religion and politics is not. The connection between mainline Protestantism and Republicanism during the late 19th century was much stronger than the correlation between evangelicalism and Republicanism today. Even as late as the Eisenhower era, this connection remained strong. Of course, this correlation is partly a reflection of the strong ties between the Republican Party and the mainstream churches, but it is also a reflection of the equally strong ties between the Democrats and the Catholic Church.

The conclusion from this graph is that religion has usually played a role in party divisions. The patterns have changed. Today attendance is a bigger predictor of voting Republican. In the past, mainline Protestantism predicted Republicanism. In the next section, we turn to explanations of the connection between religion and political divisions.

Explaining Party Divisions

The traditional problem with explaining why parties divide on some issues rather than others is that the prevailing paradigm in political science has been the median voter

theorem. This result pushes strongly towards the implication that parties will rush to the center, and if all parties are at the center then there is little possibility of explaining why Republicans and Democrats split on religion rather than economics.

To the extent that there has been an alternative paradigm, it is that the preferences of leaders or elites pull parties away from the median voter. In this case, party leaders sacrifice votes to achieve their own goals, and the implication is that parties will divide on issues that party elites really care about. This theory can potentially explain the division on religion. It wouldn't be surprising if party leaders had stronger preferences for religion-related issues than for tax policy, especially if they interact in social organizations that emphasize religion (Murphy and Shleifer, 2004). Indeed, it is quite possible that this does explain part of the tendency of parties to split on these cultural issues: this is what party leaders do seem to care most about.

Unfortunately, this theory gives us little guidance about why the connection between religion and party affiliation has changed over time, or why the connection between religion and party affiliation is different in different countries. Glaeser, Ponzetto and Shapiro (2005) show that in some countries (like India) religion correlates strongly with political affiliation but income does not. In other countries (like Sweden), income correlates strongly with political affiliation but religion does not. And in some places (like Spain) both income and religion correlate quite strongly with political affiliation. These differences can't be explained by a general tendency of leaders to care more about social issues.

To explain these differences over space and time, Glaeser, Ponzetto and Shapiro (2005) present a model of strategic extremism where parties divide on issues not to appease the tastes of the leaders but rather to increase their chances of electoral success. As Downs (1957) intuited and Riker and Ordeshook (1973) proved, extremism (defined as party policies that differ from those of the marginal voter) hinge on a turnout margin. If everyone always votes, then moving away from the center is always costly for politicians trying to get elected. Extremism can become strategic, i.e. vote enhancing, only when

there is a turnout margin so that by moving from the center, you excite your base and get them to come to the voting booths.[14]

However, a turnout margin is not enough to ensure extremism. Even with a turnout margin, going to extremes has, in principle, equal likelihood of exciting your base and exciting your opponent's base in the opposite direction. As a result, a voting margin is not enough. There must also be an asymmetry so that extremism excites your supporters more than it enrages your opponent's supporters. Glaeser, Ponzetto and Shapiro (2005) suggest a natural source of this asymmetry: the ability to target messages towards one's own supporters. If your supporters hear your messages (speeches, platforms, etc.) more than your opponents, then going to extremes will increase support more than it increases opposition. In the model, the opposition support is not fooled: they correctly anticipate what you will be saying. Nonetheless, there is still an asymmetry, because if you don't take an extreme position then your own supporters will know that you are centrist and will fail to vote.

This model suggests that policy divisions will be closely tied to the ability to send coded messages (this was called Dog Whistle Politics in the latest British parliamentary race). Large social organizations, like churches or unions, can provide politicians with just this ability. Inside a religious services or a labor meeting, outsiders are absent, and there is an ability to send targeted messages. There are of course abundant examples from Henry Ward Beecher to Pat Robertson of Churches being used to send political messages. It is also certainly true that labor unions have historically provided a key venue for dissemination of political positions.

The model suggests, somewhat surprisingly, that the influence of a social group is non-monotonic and it peaks when the group represents slightly less than one-half of the population. The intuition of this is that when the group represents the entire population, it no longer provides an opportunity to target messages, and when the group represents no

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[14] A contribution margin can work just as well. The key is that there is some margin where intensity of support matters.

one, it is no longer an important political force. When the group is slightly less than one-half of the population, then its key issues (economics in the case of unions and social issues in the case of churches) will come to dominate political division and debate.

One particularly clear example of how social groups determine policy divisions is the role of the Grand Army of the Republic (GAR) in the rise of the Grand Old Party. The GAR, a vast veteran's group from the Civil War, provided the Republican Party with a natural means of sending targeted messages reminding voters of Democrat's activities in the civil war ("not every Democrat was a rebel, but every rebel was a Democrat") and pledging future Republican policies towards veterans and freed slaves. This access ensured that Democrats and Republicans would continue to divide on Civil War related issues for 50 years after the war.

This theory then provides us with two hypotheses for the changing importance of economic and social issues in American politics and for the realignments throughout the 20th century. One candidate is the rise and fall of unionization in America. At the beginning of the century, unions were a small part of the population. Only in small areas of the population did they provide an opportunity for targeting a significant fraction of the population. In mid-century, they rose to over 30 percent of all workers and today they are back down to 12 percent (Troy 1965, www.laborresearch.org).

The rise and fall of unionization corresponds reasonably with the connection between income and Republicanism shown in Figure 10. The middle decades of the 20th century were the high point of unionism and they were also the high point of the correlation between income and Republicanism. During this time period, the Democratic Party had access to the labor unions and this created an incentive for Democrats to move to the left on economic issues to get support in this important base. The rise and decline of unions provides at least one possible reason why economic issues rose and then fell in importance.

A second hypothesis explaining the rise and fall of religion is the changes in the religious market. Over the past 80 years, there has been a decline in the numbers of mainline Protestants and a rise in the number of evangelicals. According to this hypothesis, as the mainline Protestants declined in importance, the Republican Party stopped catering to their interests, and gradually switched to issues that were more significant to the growing numbers of evangelicals. Democrats have been more successful at connecting with the rise in non-Christian religious groups (Fogel, 2001).

While this story makes perfect sense from a Republican stand point, it makes less sense for Democrats. Why didn't Democrats move to capture the votes of evangelicals? Certainly, the presidency of Jimmy Carter suggests that this was far from impossible. There are several hypotheses. First, Democratic policies towards civil rights had alienated a huge part of the evangelical population. Second, liberal elites in the Democratic Party were uncomfortable with moving to the right on social issues. Third, the Democrats were dominant during a period of rapid social change and had difficulty running against socially liberal policies that had been enacted and popular during their time in power.

This discussion has emphasized the role of religion as if churches were just another form of social group and as if religious views were no different than views over fiscal policy. But in fact, many people take their religious views far more seriously than views on other topics, and this may also help us to understand why religion is so often an important part of politics. It may be far easier to motivate voters by appealing to core religious values than to topics like tax policy, and this may be the key reason why religion is so appealing to politicians.

Whatever the cause, the trends are clear. While Republicanism used to represent mainline Protestantism, it now represents evangelicalism. The ability to send targeted messages helps us understand why social groups, such as churches or unions, end up driving the key differences between parties. As such, we should neither be surprised at today's religious politics, nor at the politics of religion in the past. As long as churches

provide politicians with an ability to send targeted messages to supporters, religious issues will be important in elections and parties will divide over religion.

Conclusion

There are many myths about America's political geography. There has not been any decrease in the number of swing states over time. Democrats and Republicans are no more geographically segregated than they have been in the past. Voting patterns may have become mildly more persistent than in the past, but persistence has usually been quite high, except for the 12 year period when the South left the Democratic fold. Cultural heterogeneity is not increasing and most people are in the middle, not at the extremes (as in Fiorina et al., 2004). Political hostility between the party members is relatively constant, although there has been an uptick in hostility over the last four years.

But all of these myths should not obscure two primary truths about American political geography. First, America is a nation with an astonishing degree of cultural diversity. The Red State/Blue State framework makes it appear that regions fall into one of two groups and this is false. There is a continuum of states ranging from the poor conservative places of the south and west to the rich, liberal places of the coasts. These places are quite different and they have been so for many years. At the state or county level, these differences line up well with political affiliation.

The roots of these geographic differences seem to come from two primary sources: industrialization and immigration. Places that industrialized earlier and that attracted more immigrants at the start of the century are much more likely to have socially liberal attitudes, much less likely to take prayer seriously, and less likely to vote Republican. These forces appear to be much more important in predicting attitudes and politics than the legacy of the Civil War, or long-standing religious differences. One theory that can explain the power of immigration and early industrialization is that the cultural attitudes associated with the Democratic party (downplaying Religion and emphasizing some

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forms of tolerance) reflect the long run effect of ethnically and religiously heterogeneous populations interacting over many decades in the marketplace

The second great truth is that American parties are increasing oriented around religion and culture rather than economics. This change has occurred since the 1970s, but in broader historical perspective it is the 1932-1976 period that is exceptional, not the current epoch. Prior to 1932, religion also predicted voting, but during that era the key correlation was between Republicanism and mainline Protestantism.

Why has religion or culture played such an important role in American party divisions? We offer two explanations. Glaeser, Ponzetto and Shapiro (2005) show that parties divide along issues where they have the ability to send targeted messages to their supporters. Religious groups provide just this ability. Second, voting is innately irrational, and emotional cultural topics may be much more effective in getting people into the voting booth than naked self-interest.

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Figure 1 -- Popular Vote Margin of Victory and Share of Electoral Votes in Battleground States (10%) in US Presidential Elections, 1840-2004
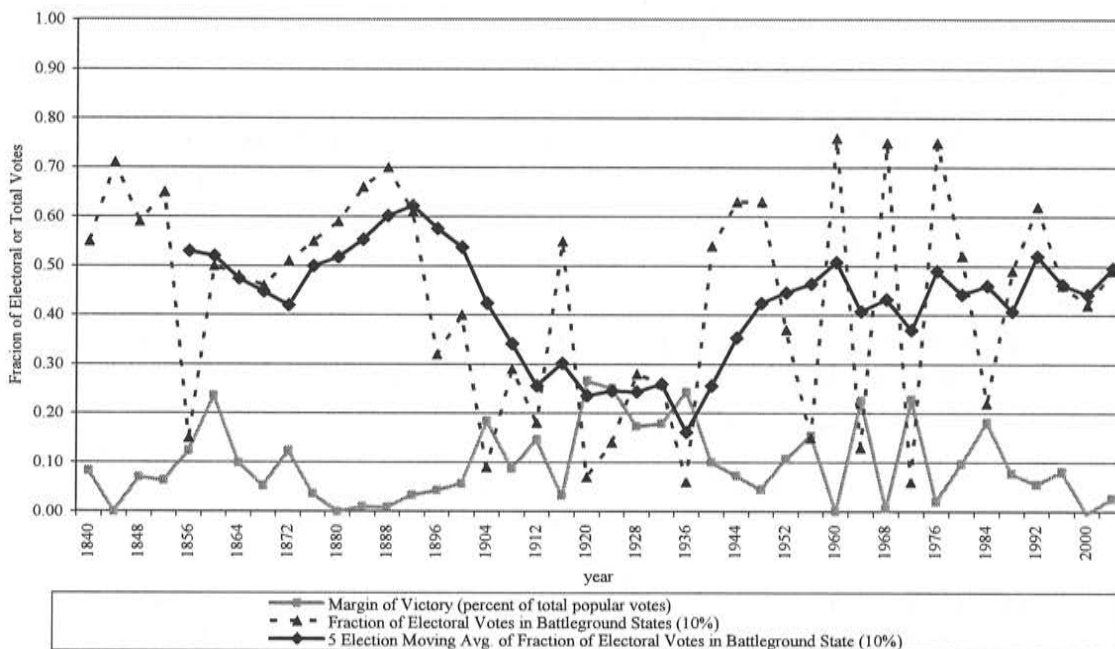
Note: Margin of Victory calculated as |(number of Democratic votes/total votes) - (number of Republican votes/total votes)|, Battleground calculated as (Margin of Victory) ≤ 10%.

Sources: Clubb, et al (2005) 1840-1972; ICPSR (1995) 1972-1988; Dave Leip's Atlas of US Presidential Elections, 1992-2004.

Figure 2 -- County Level Dissimilarity and Isolation Indices for Whig/Republican and Democratic Presidential Votes, 1840-2004
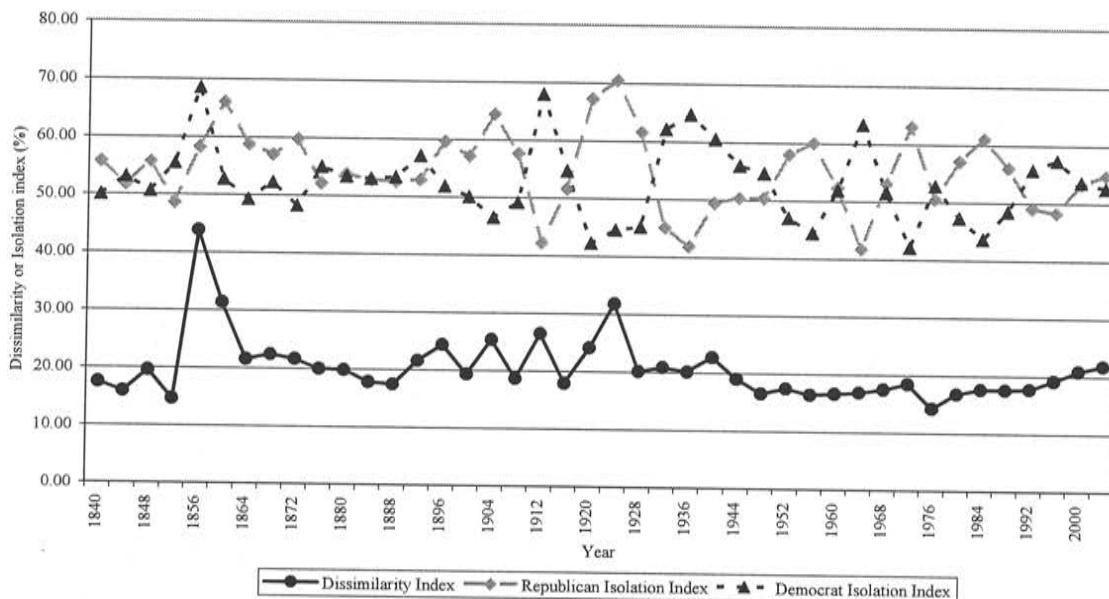
Notes: Dissmilarity index calculated by using: dissmilarity index = (100%)*(1/2) Σ |(total vote Republican in a county/total vote Republican in US) - (total vote Democrat in a county/total vote vote Democrat in US)|, and the summation was over all counties within the United States.

Isolation index calculated by using: isolation index for republicans = (100%) * Σ |(total vote Republican in a county/total vote Republican in US) - (total vote Republican in a county/total vote vote Democrat or republican in a county)|, and the summation was over all counties within the United States. A similar calculation is used for the Democrat isolation index.

Sources: Clubb, et al (2005) 1840-1972; ICPSR (1995) 1972-1988; Dave Leip's Atlas of US Presidential Elections, 1992-2004.

Figure 3 -- Persistence in Presidential Voting, 1860-2004
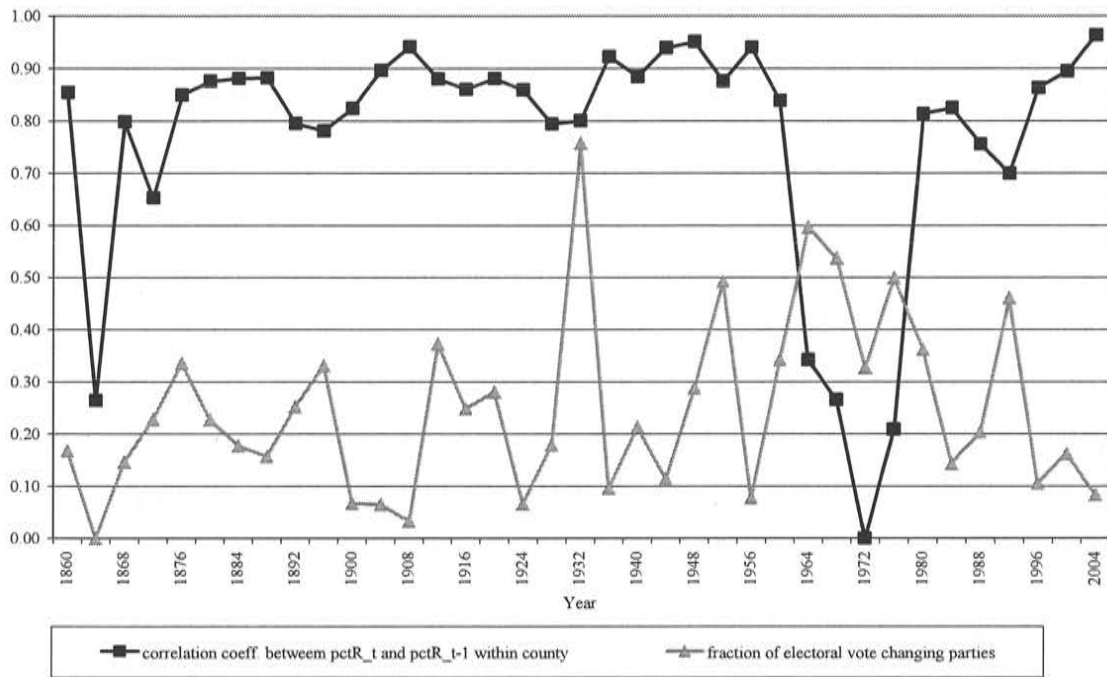
Note: Calculations take into account the change of state electoral votes for each election year.
Sources: Clubb, et al (2005) 1840-1972; ICPSR (1995) 1972-1988; Dave Leip's Atlas of US Presidential Elections, 1992-2004.

Figure 4 -- Political Partisanship, 1978-2004
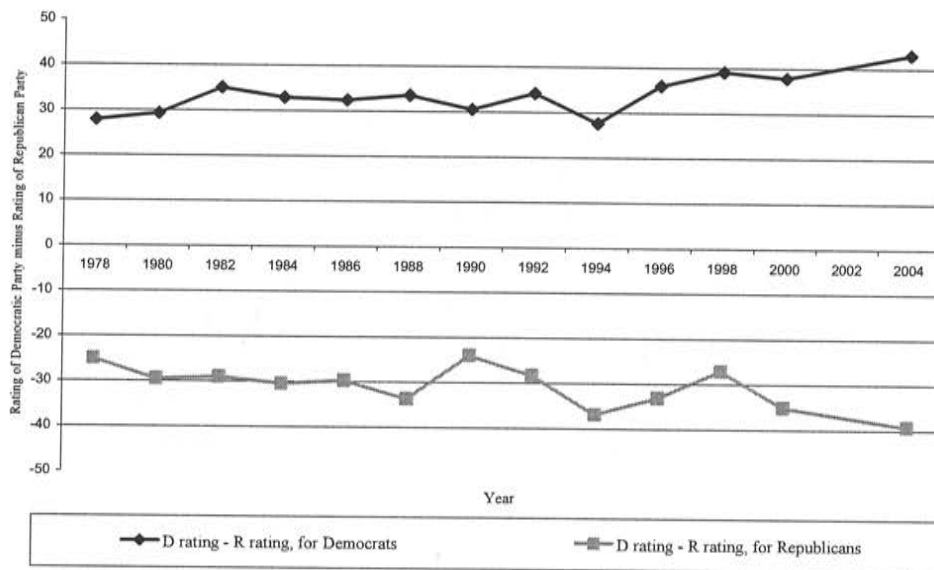
Notes: The party trend lines represent the individuals' thermometer rating of the Democratic Party minus their thermometer rating of the Republican Party averaged by their self-identifed party status.
Sources: American National Election Studies Cumulative Data File, 1948-2002 and 2004 National Election Study

Figure 5 – Correlation between Share Voting for Kerry and Belief that AIDS is Punishment from God.
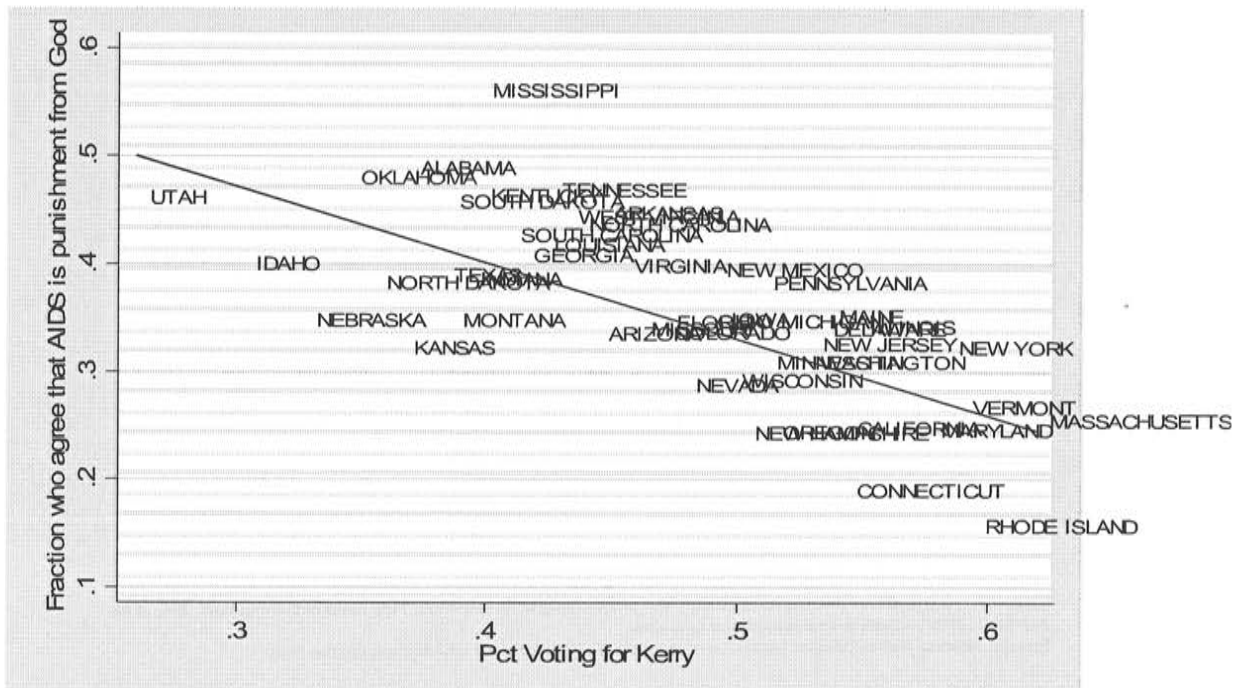
Sources: PEW 1987-2003 Values Survey (combined dataset); Dave Leip's Atlas of Presidential Elections

Figure 6 -- Trends in the Determinants of Voting Republican, 1952-2004
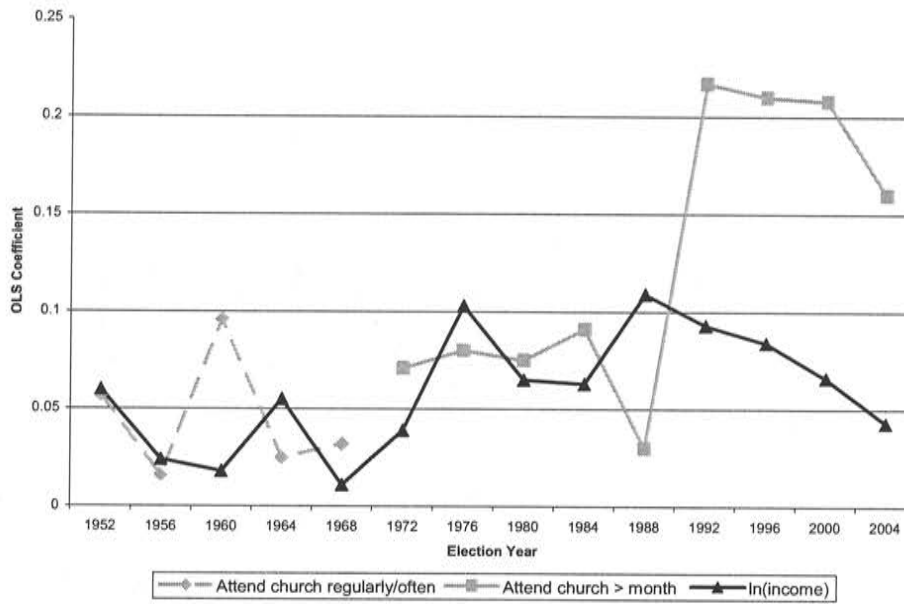
Notes – ANES 1952-2004. Coefficents are from OLS regression of probability of voting R on ln of family income, dummy if attend church more than once a month (or regularly or often for years before 1970), age, age2, race, and a dummy for completing college.

Figure 7 -- Relationship between ln(Median County Income 1950) and Voting Republican
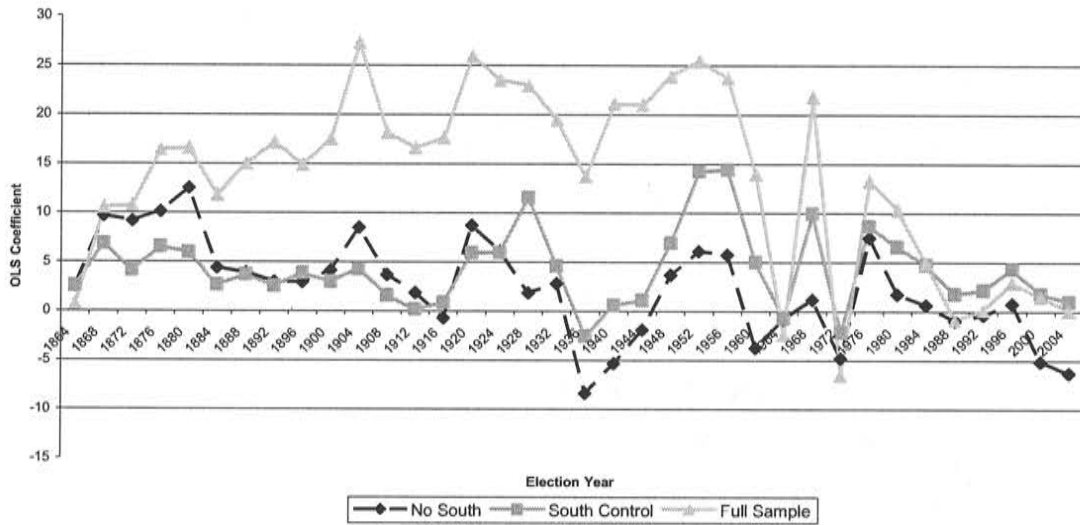
Notes -- Lines represent coefficients from univariate regressions of ln(median county income 1950) on the share voting Republican. For 1912, we use the combined Republican and Progressive percentage.

Sources: Clubb, et al (2005) 1840-1972; ICPSR (1995) 1972-1988; Dave Leip's Atlas of US Presidential Elections, 1992-2004; Haines and ICPSR (2005); Bradley, et al (1992)

Figure 8 -- Relationship between Religion and Voting Republican at the County Level, 1864-2004
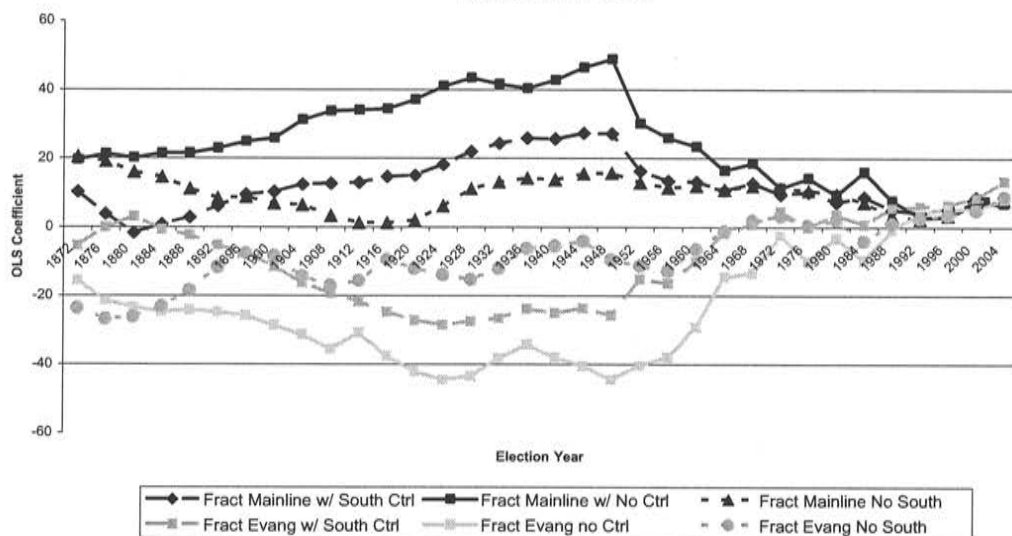
Notes – Lines represent 3-election moving averages of coefficients from univariate regressions on the share voting Republican. Fraction of religious adherents computed for 1890, 1926, 1952, and 1990. Coefficients are computed using the closest year. For 1912, we use the combined Republican and Progressive percentage.
Sources: Clubb, et al (2005) 1840-1972; ICPSR (1995) 1972-1988; Dave Leip's Atlas of US Presidential Elections, 1992-2004; Haines and ICPSR (2005); Bradley, et al (1992)

Table 1 -- Heterogeneity in Beliefs, Behaviors, and Economic Conditions Across States

A: Beliefs -- Fraction of state's respondents who agree with the given statement:

1. State	N	Schools should fire homosexual teachers.
Massachusetts	430	0.23
District of Columbia	74	0.26
Connecticut	272	0.26
Maryland	449	0.27
New Jersey	588	0.29
West Virginia	230	0.54
Oklahoma	261	0.56
Tennessee	514	0.60
Arkansas	226	0.61
Mississippi	283	0.65

2. State	N	It is okay for blacks and whites to date.
Kentucky	339	0.35
West Virginia	230	0.40
Tennessee	497	0.41
South Carolina	322	0.43
Alabama	382	0.46
Oregon	240	0.77
California	1860	0.77
Delaware	58	0.79
Maine	124	0.81
District of Columbia	74	0.88

3. State	N	AIDS is God's punishment for immoral sexual behavior.
Rhode Island	83	0.16
Connecticut	243	0.19
New Hampshire	74	0.24
Oregon	226	0.24
Maryland	375	0.25
Kentucky	309	0.46
Tennessee	438	0.47
Oklahoma	221	0.48
Alabama	364	0.49
Mississippi	232	0.56

4. State	N	The best way to ensure peace is through military strength.
District of Columbia	77	0.36
Vermont	52	0.40
Oregon	257	0.42
Delaware	62	0.42
Minnesota	418	0.47
Idaho	122	0.66
Oklahoma	265	0.68
Mississippi	281	0.69
Arkansas	230	0.70
South Carolina	330	0.73

5. State	N	When something is run by the government, it is usually inefficient and wasteful.
District of Columbia	77	0.45
Mississippi	292	0.51
Delaware	63	0.57
Nevada	87	0.57
South Carolina	339	0.58
Montana	113	0.72
Nebraska	189	0.72
Arkansas	242	0.74
Oregon	262	0.74
South Dakota	71	0.77

6. State	N	We will all be called before God on Judgement Day to answer for our sins.
Vermont	51	0.53
Rhode Island	96	0.60
Oregon	250	0.63
New Hampshire	88	0.65
Nevada	79	0.67
Tennessee	492	0.92
South Carolina	299	0.93
Oklahoma	247	0.94
Alabama	377	0.94
Mississippi	266	0.95

B: Consumption and Conditions:

7. State	Gallons of wine sold per capita, 2002
West Virginia	0.79
Mississippi	0.89
Oklahoma	1.01
Arkansas	1.05
Iowa	1.07
Massachusetts	4.18
Nevada	4.70
Idaho	4.94
New Hampshire	5.34
District of Columbia	6.49

8. State	2003 Median Household Income
Arkansas	32,002
Mississippi	32,728
West Virginia	32,763
Louisiana	33,507
Montana	34,108
Minnesota	52,823
Virginia	54,783
Connecticut	54,965
New Hampshire	55,567
New Jersey	56,045

Notes: Data for beliefs are from the Pew Values Survey 1987-2003 Merged File. The fraction agreeing is computed by combining individuals who completely or mostly agree and dividing that number by the total number of respondents. Data on wine consumption per capita is from NIH Publication No. 04-5563 (2004). Median household income is from the census.

Sources: PEW 1987-2003 Values Survey (combined dataset); NIH Publication No. 04-5563 (2004); U.S. Census Bureau

Table 2 -- Historical Determinants of State Beliefs and State and County Voting Patterns

	(1)	(2)	(3)	(4)	(5)	(6)		(7)
	AIDS is punishment from God	Schools should fire homosexuals	It is ok for blacks and whites to date	Prayer is important for daily life	Ensure peace thru military strength	Pct Voting for Kerry		Pct Voting for Kerry
Percent of religious aderents evangelical, 1926	0.13 (0.070)*	0.11 (0.110)	-0.26 (0.118)**	0.13 (0.067)*	0.18 (0.070)**	-0.014 -0.079		0.031 (0.033)
ln(1+percent of population slave in 1850)	-0.01 (0.010)	-0.01 (0.016)	0.02 (0.017)	-0.01 (0.009)	0.00 (0.007)	0.012 (0.009)		0.007 (0.006)
Percent of population foreign born, 1920	-0.27 (0.118)**	-0.50 (0.148)***	0.45 (0.207)**	-0.34 (0.147)**	0.06 (0.157)	0.242 (0.139)*		0.413 (.079)***
Share of pop >10 yrs working in Mfg, 1920	-0.28 (0.060)***	-0.26 (0.080)***	0.04 (0.100)	-0.23 (0.092)**	-0.16 (0.068)**	0.417 (0.073)***		0.42 (.096)***
Constant	0.452 (0.031)***	0.535 (0.034)***	0.59 (0.051)***	0.86 (0.035)***	0.574 (0.040)***	0.309 (0.044)***		0.32 (.023)***
Observations	47	47	47	47	47	47		2822
R-squared	0.67	0.7	0.58	0.65	0.48	0.56		0.14

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Notes: All results are from OLS regresstions and exclude Alsaka, Hawaii, and Wyoming.
Sources: PEW 1987-2003 Values Survey (combined dataset) ; Dave Leip's Atlas of
Presidential Election; Haines and ICPSR (2005);

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	A	B	C	D	E	F	G	H	I	J	K
1	District	Inc	R-Open	D-Open	D-Dinc	D-Rinc	R-Dinc	R-Rinc		Dem	Rep
2	1	R	16,425	16,083	17,310	15,466	15,486	16,908		15465.8	16908.46
3	2	R	16,354	12,395	13,605	11,786	15,427	16,831		11785.63	16830.84
4	3	R	16,605	12,606	13,735	12,038	15,741	17,050		12038.47	17049.81
5	4	R	15,595	13,938	15,121	13,343	14,689	16,061		13342.57	16061.34
6	5	R	16,017	12,710	13,865	12,129	15,132	16,472		12128.53	16472.43
7	6	R	14,938	10,929	12,129	10,325	14,019	15,411		10325	15411.38
8	7	O	11,778	13,793	14,951	13,210	10,891	12,235		13793.23	11778.25
9	8	D	1,695	7,192	7,953	6,809	1,112	1,995		7953.472	1111.873
10	9	D	4,469	9,888	10,776	9,440	3,789	4,820		10776.43	3788.842
11	10	D	2,897	25,273	26,384	24,714	2,046	3,335		26383.71	2046.485
12	11	O	3,453	21,709	22,745	21,188	2,659	3,861		21709.26	3452.523
13	12	D	5,222	19,700	20,767	19,164	4,405	5,642		20766.93	4405.047
14	13	O	20,358	13,345	14,566	12,731	19,423	20,839		13345.35	20357.6
15	14	R	21,025	14,499	15,677	13,906	20,124	21,490		13906.02	21489.72
16	15	O	17,310	13,006	14,247	12,381	16,359	17,800		13005.66	17310.11
17	16	D	2,340	22,502	23,587	21,955	1,509	2,768		23586.78	1509.253
18	17	O	4,047	24,088	25,165	23,546	3,222	4,472		24087.94	4047.133
19	18	O	2,692	22,204	23,271	21,667	1,875	3,113		22203.8	2691.859
20	19	D	10,364	22,759	24,177	22,045	9,278	10,923		24177.07	9277.917
21	20	D	12,856	16,066	17,275	15,458	11,931	13,333		17274.67	11931.04
22	21	R	15,324	12,566	13,740	11,976	14,425	15,786		11975.54	15786.25
23	22	R	22,958	11,290	12,482	10,690	22,046	23,428		10690.48	23427.75
24	23	R	21,608	14,232	15,416	13,636	20,702	22,075		13635.62	22075.2
25	24	R	20,335	13,885	15,085	13,280	19,416	20,809		13280.33	20808.5
26	25	O	15,914	12,038	13,251	11,427	14,985	16,392		12037.84	15914.22
27	26	R	15,556	13,636	14,806	13,047	14,660	16,017		13047	16016.82
28	27	R	16,360	14,709	15,871	14,124	15,470	16,818		14123.84	16818.46
29	28	R	15,302	12,719	13,906	12,122	14,393	15,770		12121.71	15769.79
30	29	R	14,663	12,910	14,128	12,297	13,730	15,143		12296.84	15142.66
31	30	R	16,894	13,974	15,159	13,378	15,987	17,361		13378.13	17361.15
32	31	R	15,615	13,273	14,417	12,698	14,739	16,066		12697.73	16065.83
33	32	R	15,353	11,251	12,395	10,675	14,476	15,804		10675.11	15803.65
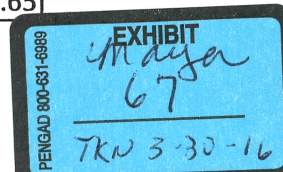
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	A	B	C	D	E	F	G	H	I	J	K
1	District	Inc	R-Open	D-Open	D-Dinc	D-Rinc	R-Dinc	R-Rinc		Dem	Rep
34	33	R	18,297	11,225	12,404	10,631	17,394	18,762		10631.39	18761.86
35	34	O	19,353	12,444	13,745	11,790	18,357	19,865		12444.29	19352.85
36	35	O	15,525	12,270	13,509	11,647	14,577	16,014		12270.24	15525.27
37	36	R	15,672	11,403	12,644	10,779	14,722	16,161		10779.05	16160.54
38	37	O	16,202	12,707	13,863	12,125	15,317	16,658		12707.18	16201.94
39	38	R	19,129	12,663	13,835	12,073	18,231	19,590		12073.29	19590.45
40	39	O	17,194	11,487	12,678	10,888	16,282	17,663		11487.33	17193.63
41	40	R	13,595	11,480	12,651	10,890	12,699	14,057		10890.5	14056.69
42	41	R	14,511	11,717	12,940	11,101	13,575	14,994		11101.12	14993.54
43	42	R	15,480	13,708	14,872	13,122	14,589	15,939		13122.38	15938.79
44	43	O	13,073	17,378	18,614	16,757	12,127	13,561		17378.5	13073.44
45	44	R	10,304	16,680	17,857	16,088	9,403	10,768		16087.98	10767.71
46	45	D	9,691	15,153	16,279	14,587	8,828	10,134		16279.09	8828.477
47	46	D	11,528	19,163	20,288	18,597	10,667	11,972		20287.73	10667.25
48	47	O	9,340	21,609	22,739	21,041	8,475	9,785		21609.22	9340.059
49	48	O	7,635	24,517	25,703	23,920	6,726	8,102		24516.71	7634.698
50	49	R	13,622	12,308	13,515	11,701	12,698	14,098		11700.58	14098.02
51	50	R	12,327	12,468	13,640	11,878	11,430	12,789		11877.84	12789.11
52	51	R	13,048	14,173	15,362	13,575	12,138	13,516		13574.58	13516.45
53	52	R	15,646	11,307	12,487	10,713	14,742	16,111		10712.95	16110.64
54	53	O	16,313	9,717	10,787	9,178	15,494	16,735		9716.741	16312.79
55	54	D	12,882	15,180	16,441	14,545	11,916	13,379		16440.81	11916.44
56	55	R	16,968	12,631	13,822	12,032	16,056	17,437		12032.13	17437.2
57	56	O	18,554	12,580	13,743	11,995	17,664	19,013		12580.39	18554.38
58	57	D	11,628	14,383	15,547	13,797	10,737	12,087		15547.49	10736.9
59	58	R	22,433	8,834	10,022	8,236	21,523	22,902		8236.174	22901.51
60	59	R	21,727	8,785	9,968	8,190	20,822	22,194		8189.898	22193.73
61	60	R	23,961	9,853	11,045	9,253	23,049	24,431		9253.341	24431.3
62	61	O	16,466	13,130	14,299	12,541	15,571	16,927		13129.87	16465.99
63	62	O	17,307	14,827	16,022	14,226	16,393	17,778		14827.12	17307.15
64	63	R	16,606	13,059	14,201	12,484	15,732	17,056		12484.44	17056.42
65	64	D	11,289	15,687	16,837	15,108	10,408	11,742		16837.43	10408.06

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	A	B	C	D	E	F	G	H	I	J	K
1	District	Inc	R-Open	D-Open	D-Dinc	D-Rinc	R-Dinc	R-Rinc		Dem	Rep
66	65	O	7,929	15,105	16,177	14,566	7,109	8,352		15105.13	7929.218
67	66	D	5,472	16,165	17,217	15,635	4,666	5,887		17217.27	4666.367
68	67	R	14,675	13,770	14,960	13,172	13,764	15,145		13171.64	15144.5
69	68	R	13,019	13,665	14,797	13,096	12,152	13,465		13095.99	13464.76
70	69	R	14,347	11,083	12,244	10,498	13,458	14,805		10498.26	14804.5
71	70	D	14,387	12,211	13,406	11,609	13,472	14,858		13406.14	13472.05
72	71	O	11,383	17,614	18,867	16,983	10,423	11,877		17613.5	11382.77
73	72	R	13,895	14,294	15,529	13,672	12,949	14,382		13671.89	14382
74	73	D	10,784	17,353	18,586	16,732	9,840	11,270		18586.38	9839.617
75	74	D	13,772	17,095	18,349	16,463	12,811	14,266		18349.33	12810.92
76	75	R	13,418	15,000	16,234	14,380	12,474	13,904		14379.71	13904.42
77	76	D	6,805	30,939	32,329	30,240	5,741	7,353		32328.66	5741.166
78	77	D	6,041	26,925	28,094	26,337	5,146	6,501		28094.35	5145.551
79	78	D	9,857	24,163	25,321	23,580	8,970	10,314		25321.43	8970.029
80	79	O	13,975	20,753	21,900	20,175	13,096	14,427		20752.59	13974.56
81	80	D	12,598	20,357	21,489	19,787	11,731	13,044		21488.5	11731.32
82	81	D	12,340	16,317	17,498	15,723	11,436	12,805		17497.69	11435.96
83	82	R	18,085	12,168	13,376	11,560	17,161	18,561		11560.49	18561.46
84	83	R	23,755	10,186	11,378	9,586	22,842	24,225		9585.595	24224.85
85	84	R	18,765	12,503	13,712	11,895	17,839	19,241		11895.14	19241.38
86	85	O	12,926	13,619	14,806	13,022	12,018	13,394		13619.03	12926.13
87	86	O	17,150	13,419	14,599	12,824	16,246	17,616		13418.64	17150.39
88	87	R	15,082	11,750	12,955	11,144	14,160	15,557		11144.2	15557.08
89	88	R	14,380	13,141	14,278	12,569	13,509	14,828		12568.6	14827.88
90	89	R	15,516	11,610	12,817	11,003	14,593	15,992		11003.4	15991.57
91	90	O	7,309	12,080	13,179	11,527	6,467	7,742		12079.84	7309.138
92	91	O	11,828	18,032	19,313	17,387	10,847	12,333		18031.91	11828.19
93	92	D	11,424	14,271	15,442	13,682	10,528	11,886		15442.38	10527.82
94	93	R	15,420	15,283	16,488	14,677	14,498	15,895		14677.17	15895.17
95	94	D	12,954	17,408	18,566	16,826	12,068	13,411		18566	12068
96	95	D	9,627	19,804	21,109	19,148	8,629	10,142		21108.97	8628.513
97	96	R	14,857	10,966	12,125	10,382	13,970	15,314		10382.5	15314.36

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	A	B	C	D	E	F	G	H	I	J	K
1	District	Inc	R-Open	D-Open	D-Dinc	D-Rinc	R-Dinc	R-Rinc		Dem	Rep
98	97	R	18,039	10,826	11,987	10,241	17,149	18,496		10240.9	18496.45
99	98	R	21,855	10,182	11,381	9,579	20,938	22,328		9579.011	22327.97
100	99	R	25,519	8,347	9,498	7,768	24,638	25,973		7768.103	25972.79

Inc Calcs My plan

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	District	Incumbent	D-Open	R-Open	D- Dinc	D- Rinc	R-Dinc	R-Rinc		D- Vote	R vote		Open total	Dinc T	Rinc ToT
2	1	R	16,259	16414	17502.34	15632.83	15461.81	16904.27		15632.83	16904.27		32,673	32,964	32,537
3	2	R	11,805	10025	12899.24	11254.58	9187.796	10456.76		11254.58	10456.76		21,831	22,087	21,711
4	3	R	11,243	17807	12391.86	10664.87	16927.78	18260.28		10664.87	18260.28		29,050	29,320	28,925
5	4	O	10,881	12790	12082.57	10276.24	11870.04	13263.75		10880.96	12790.08		23,671	23,953	23,540
6	5	R	13,497	13845	14709.15	12887.41	12917.15	14322.76		12887.41	14322.76		27,342	27,626	27,210
7	6	O	11,045	17627	12188.96	10468.65	16750.91	18078.25		11044.57	17627.14		28,672	28,940	28,547
8	7	D	22,822	10214	24236.74	22109.87	9130.38	10771.41		24236.74	9130.38		33,036	33,367	32,881
9	8	D	7,192	1695	7953.472	6809.138	1111.873	1994.806		7953.472	1111.873		8,887	9,065	8,804
10	9	D	10,497	5635	11438.73	10023.26	4914.505	6006.64		11438.73	4914.505		16,133	16,353	16,030
11	10	O	25,348	3270	26460.11	24788.93	2418.787	3708.222		25348.4	3269.998		28,618	28,879	28,497
12	11	O	22,374	4855	23453.23	21830.99	4028.977	5280.651		22374.08	4855.262		27,229	27,482	27,112
13	12	O	20,041	4039	21063.76	19526	3255.687	4442.177		20040.8	4038.94		24,080	24,319	23,968
14	13	D	15,950	16510	17151.65	15345.29	15589.93	16983.66		17151.65	15589.93		32,460	32,742	32,329
15	14	O	13,575	13799	14785.79	12966.12	12872.06	14276.06		13575.3	13798.91		27,374	27,658	27,242
16	15	O	13,412	14901	14631.57	12797.95	13966.96	15381.73		13411.8	14900.91		28,313	28,599	28,180
17	16	D	21,234	2856	22329.23	20683.07	2017.472	3287.6		22329.23	2017.472		24,090	24,347	23,971
18	17	O	21,769	3569	22817.51	21242.07	2766.483	3982.046		21769.49	3568.929		25,338	25,584	25,224
19	18	O	23,817	4954	24917.42	23262.77	4111.682	5388.36		23816.71	4954.473		28,771	29,029	28,651
20	19	D	15,160	10904	16310.39	14580.58	10022.56	11357.24		16310.39	10022.56		26,063	26,333	25,938
21	20	R	14,118	12901	15289.15	13528.88	12004.15	13362.32		13528.88	13362.32		27,019	27,293	26,891
22	21	O	12,257	16911	13415.94	11673.84	16023.8	17367.96		12257.05	16911.14		29,168	29,440	29,042
23	22	D	18,335	14831	19465.27	17765.87	13965.52	15276.72		19465.27	13965.52		33,166	33,431	33,043
24	23	R	10,922	25459	12134.46	10312.17	24530.8	25936.83		10312.17	25936.83		36,381	36,665	36,249
25	24	R	8,667	25868	9860.713	8065.671	24954.03	26339.03		8065.671	26339.03		34,535	34,815	34,405
26	25	R	12,179	18248	13348.91	11590.24	17351.77	18708.7		11590.24	18708.7		30,427	30,701	30,299
27	26	O	13,251	14527	14483.88	12630.13	13582.39	15012.69		13250.72	14526.59		27,777	28,066	27,643
28	27	R	14,935	11755	16072.89	14361.98	10883.16	12203.25		14361.98	12203.25		26,689	26,956	26,565
29	28	R	12,617	15591	13797.57	12023.5	14687.36	16056.18		12023.5	16056.18		28,208	28,485	28,080
30	29	R	14,180	12954	15394.22	13569.26	12024.65	13432.74		13569.26	13432.74		27,134	27,419	27,002
31	30	R	11,308	15165	12511.46	10701.77	14243	15639.3		10701.77	15639.3		26,472	26,754	26,341
32	31	R	11,304	16117	12470.19	10717.48	15223.88	16576.22		10717.48	16576.22		27,421	27,694	27,294
33	32	R	12,685	13787	13855.81	12096.51	12890.91	14248.34		12096.51	14248.34		26,472	26,747	26,345
34	33	O	14,609	10151	15736.78	14041.87	9288.036	10595.78		14609.29	10151.34		24,761	25,025	24,638
35	34	O	13,139	15690	14405.66	12501.92	14719.94	16188.81		13139.24	15689.6		28,829	29,126	28,691
36	35	R	11,288	16503	12549.47	10653.1	15536.95	17000.13		10653.1	17000.13		27,791	28,086	27,653
37	36	R	11,516	14997	12745.66	10897.23	14055.87	15482.07		10897.23	15482.07		26,513	26,802	26,379
38	37	O	9,222	22240	10396.19	8630.555	21340.53	22702.84		9221.646	22239.85		31,461	31,737	31,333
39	38	R	9,710	25021	10915.32	9103.675	24098.05	25495.86		9103.675	25495.86		34,731	35,013	34,600
40	39	R	10,747	17526	11922.64	10155.32	16626.14	17989.75		10155.32	17989.75		28,273	28,549	28,145
41	40	O	15,061	13947	16264.75	14454.96	13025.64	14422.01		15060.83	13947.45		29,008	29,290	28,877
42	41	O	16,784	13120	18044.34	16149.39	12154.41	13616.49		16783.77	13119.59		29,903	30,199	29,766

Inc Calcs My plan

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	District	Incumbent	D-Open	R-Open	D- Dinc	D- Rinc	R-Dinc	R-Rinc		D- Vote	R vote		Open total	Dinc T	Rinc ToT
43	42	O	13,254	12282	14417.12	12668.63	11391.63	12740.71		13253.98	12282.22		25,536	25,809	25,409
44	43	O	12,658	13606	13783.03	12091.95	12744.46	14049.24		12658.08	13605.8		26,264	26,527	26,141
45	44	D	16,477	10886	17643.35	15890.24	9993.327	11345.97		17643.35	9993.327		27,363	27,637	27,236
46	45	D	16,352	13589	17535.1	15756.8	12682.77	14054.86		17535.1	12682.77		29,941	30,218	29,812
47	46	O	20,583	11418	21728.78	20006.19	10540.51	11869.62		20582.87	11417.91		32,001	32,269	31,876
48	47	O	20,208	9888	21292.03	19661.89	9057.854	10315.62		20207.62	9888.161		30,096	30,350	29,978
49	48	O	24,457	8840	25638.94	23861.44	7934.495	9305.958		24456.5	8839.858		33,296	33,573	33,167
50	49	Y	13,625	13477	14853.77	13005.95	12535.84	13961.56		13624.55	13477.02		27,102	27,390	26,968
51	50	Y	12,289	13709	13460.47	11699.63	12811.93	14170.54		12289.12	13708.8		25,998	26,272	25,870
52	51	O	14,760	13323	15942.69	14164.11	12417.18	13789.48		14759.53	13323.1		28,083	28,360	27,954
53	52	R	12,376	19416	13566.95	11777.26	18504.51	19885.38		11777.26	19885.38		31,792	32,071	31,663
54	53	R	12,388	13362	13590.4	11783.59	12441.86	13835.94		11783.59	13835.94		25,751	26,032	25,620
55	54	D	14,032	12240	15241.09	13422.95	11313.8	12716.62		15241.09	11313.8		26,271	26,555	26,140
56	55	R	13,565	15300	14728.45	12978.75	14408.58	15758.6		12978.75	15758.6		28,864	29,137	28,737
57	56	O	12,553	14518	13674.12	11988.23	13659.13	14959.92		12552.62	14517.84		27,070	27,333	26,948
58	57	D	14,897	13016	16060.77	14311.11	12124.56	13474.54		16060.77	12124.56		27,913	28,185	27,786
59	58	O	9,325	21180	10507.34	8730.51	20274.7	21645.65		9325.349	21179.72		30,505	30,782	30,376
60	59	R	11,565	21984	12767.07	10960.28	21063.57	22457.63		10960.28	22457.63		33,549	33,831	33,418
61	60	R	8,756	22415	9954.165	8152.324	21497.39	22887.64		8152.324	22887.64		31,171	31,452	31,040
62	61	O	12,933	16576	14102.27	12344.9	15681.29	17037.23		12933.22	16576.4		29,510	29,784	29,382
63	62	O	15,181	9999	16269.98	14632.61	9165.051	10428.4		15180.76	9999.044		25,180	25,435	25,061
64	63	D	15,640	9902	16785.11	15064.02	9025.313	10353.25		16785.11	9025.313		25,542	25,810	25,417
65	64	O	15,089	13470	16220.28	14519.68	12603.39	13915.53		15089	13469.59		28,559	28,824	28,435
66	65	R	12,721	19816	13900.01	12127.44	18912.7	20280.36		12127.44	20280.36		32,536	32,813	32,408
67	66	D	16,286	6362	17358.56	15745.93	5541.069	6785.326		17358.56	5541.069		22,648	22,900	22,531
68	67	R	15,321	14226	16511.01	14721.46	13314.18	14694.94		14721.46	14694.94		29,546	29,825	29,416
69	68	O	11,958	12124	13065.57	11400.14	11275.35	12560.35		11957.69	12123.63		24,081	24,341	23,960
70	69	O	17,902	12022	19187.11	17255.18	11038.46	12529.08		17901.94	12022.48		29,924	30,226	29,784
71	70	D	18,661	12266	19778.87	18097.95	11409.82	12706.77		19778.87	11409.82		30,927	31,189	30,805
72	71	O	15,081	13884	16277.28	14478.48	12967.45	14355.35		15080.68	13883.66		28,964	29,245	28,834
73	72	R	11,180	16542	12388.97	10572.19	15616.44	17018.21		10572.19	17018.21		27,722	28,005	27,590
74	73	D	17,137	10785	18367.89	16516.82	9842.144	11270.37		18367.89	9842.144		27,921	28,210	27,787
75	74	O	17,712	14219	18961.55	17083.33	13261.95	14711.12		17712.11	14218.61		31,931	32,223	31,794
76	75	D	13,902	17700	15186.33	13255.18	16716.66	18206.68		15186.33	16716.66		31,602	31,903	31,462
77	76	D	30,929	6811	32317.67	30229.45	5747.109	7358.318		32317.67	5747.109		37,739	38,065	37,588
78	77	D	26,708	6059	27871.27	26122.97	5168.348	6517.284		27871.27	5168.348		32,767	33,040	32,640
79	78	D	24,413	9847	25577.56	23826.67	8954.864	10305.8		25577.56	8954.864		34,260	34,532	34,132
80	79	O	20,439	13294	21611.87	19848.06	12395.66	13756.56		20438.54	13294.05		33,733	34,008	33,605
81	80	D	20,179	11644	21333.24	19597.53	10759.88	12099.1		21333.24	10759.88		31,823	32,093	31,697
82	81	R	13,703	12741	14875.89	13112.77	11843.22	13203.58		13112.77	13203.58		26,444	26,719	26,316
83	82	R	9,871	21201	11032.89	9286.553	20311.96	21659.38		9286.553	21659.38		31,073	31,345	30,946

Inc Calcs My plan

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	District	Incumbent	D-Open	R-Open	D- Dinc	D- Rinc	R-Dinc	R-Rinc		D- Vote	R vote		Open total	Dinc T	Rinc ToT
84	83	R	9,241	23075	10443.39	8635.957	22154.33	23548.89		8635.957	23548.89		32,316	32,598	32,185
85	84	R	11,990	22700	13195.48	11382.78	21776.65	23175.28		11382.78	23175.28		34,690	34,972	34,558
86	85	R	10,028	13190	11172.3	9452.58	12313.87	13640.75		9452.58	13640.75		23,218	23,486	23,093
87	86	R	13,853	13494	15084.08	13233.04	12550.71	13978.92		13233.04	13978.92		27,346	27,635	27,212
88	87	R	11,358	17003	12515.78	10774.65	16115.91	17459.31		10774.65	17459.31		28,360	28,632	28,234
89	88	R	14,209	11142	15372.2	13623.11	10251.32	11600.86		13623.11	11600.86		25,351	25,624	25,224
90	89	O	13,374	15771	14562.1	12775.43	14860.66	16239.2		13373.56	15770.7		29,144	29,423	29,015
91	90	R	11,349	17468	12503.87	10768.19	16583.99	17923.19		10768.19	17923.19		28,817	29,088	28,691
92	91	R	14,807	13845	16042.97	14185.61	12899.12	14332.2		14185.61	14332.2		28,653	28,942	28,518
93	92	O	14,907	14594	16129.87	14290.93	13656.84	15075.72		14906.56	14593.5		29,500	29,787	29,367
94	93	R	12,441	18057	13580.46	11867.68	17184.46	18505.98		11867.68	18505.98		30,498	30,765	30,374
95	94	D	16,171	11759	17346.68	15579.24	10858.6	12222.31		17346.68	10858.6		27,930	28,205	27,802
96	95	D	19,769	9949	21071.89	19113.04	8951.636	10463.03		21071.89	8951.636		29,718	30,024	29,576
97	96	O	14,665	13836	15840.6	14073.87	12935.82	14298.97		14665.33	13835.7		28,501	28,776	28,373
98	97	R	11,492	24222	12695.92	10886.73	23300.36	24696.28		10886.73	24696.28		35,714	35,996	35,583
99	98	R	9,864	24773	11044.01	9270.213	23869.45	25238.06		9270.213	25238.06		34,637	34,913	34,508
100	99	R	10,783	19160	11978.68	10181.01	18244.09	19631.11		10181.01	19631.11		29,943	30,223	29,812

EG act 43 With Inc

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	District	Pop	Dev	% Dev	Net D	Predicted Dem	D Pct	Predicted Rep	R PCT	D Lost	R Lost	D Surplus	R Surplus	D Wasted	R Wasted	R-D Net	Rep Win
2	1	57487	43	0.07%		15465.7997	47.8%	16908.4605	52.2%	15466	-	-	721	15,466	721	14,744	1
3	2	57590	146	0.25%		11785.6328	41.2%	16830.8359	58.8%	11786	-	-	2,523	11,786	2,523	9,263	1
4	3	57686	242	0.42%		12038.4725	41.4%	17049.8093	58.6%	12038	-	-	2,506	12,038	2,506	9,533	1
5	4	57406	-38	-0.07%		13342.5658	45.4%	16061.3418	54.6%	13343	-	-	1,359	13,343	1,359	11,983	1
6	5	57633	189	0.33%		12128.5334	42.4%	16472.4273	57.6%	12129	-	-	2,172	12,129	2,172	9,957	1
7	6	57480	36	0.06%		10324.9964	40.1%	15411.384	59.9%	10325	-	-	2,543	10,325	2,543	7,782	1
8	7	57208	-236	-0.41%		13793.234	53.9%	11778.2539	46.1%	0	11,778	1,007	-	1,007	11,778	(10,771)	0
9	8	57196	-248	-0.43%		7953.47153	87.7%	1111.87306	12.3%	0	1,112	3,421	-	3,421	1,112	2,309	0
10	9	57420	-24	-0.04%		10776.4332	74.0%	3788.84183	26.0%	0	3,789	3,494	-	3,494	3,789	(295)	0
11	10	57195	-249	-0.43%		26383.7072	92.8%	2046.48471	7.2%	0	2,046	12,169	-	12,169	2,046	10,122	0
12	11	57455	11	0.02%		21709.2604	86.3%	3452.52337	13.7%	0	3,453	9,128	-	9,128	3,453	5,676	0
13	12	57420	-24	-0.04%		20766.9266	82.5%	4405.04662	17.5%	0	4,405	8,181	-	8,181	4,405	3,776	0
14	13	57248	-196	-0.34%		13345.347	39.6%	20357.6027	60.4%	13345	-	-	3,506	13,345	3,506	9,839	1
15	14	57333	-111	-0.19%		13906.0208	39.3%	21489.7163	60.7%	13906	-	-	3,792	13,906	3,792	10,114	1
16	15	57514	70	0.12%		13005.6554	42.9%	17310.1108	57.1%	13006	-	-	2,152	13,006	2,152	10,853	1
17	16	57282	-162	-0.28%		23586.7809	94.0%	1509.25252	6.0%	0	1,509	11,039	-	11,039	1,509	9,530	0
18	17	57437	-7	-0.01%		24087.9444	85.6%	4047.13312	14.4%	0	4,047	10,020	-	10,020	4,047	5,973	0
19	18	57241	-203	-0.35%		22203.803	89.2%	2691.85868	10.8%	0	2,692	9,756	-	9,756	2,692	7,064	0
20	19	57313	-131	-0.23%		24177.0672	72.3%	9277.9171	27.7%	0	9,278	7,450	-	7,450	9,278	(1,828)	0
21	20	57410	-34	-0.06%		17274.6699	59.1%	11931.0371	40.9%	0	11,931	2,672	-	2,672	11,931	(9,259)	0
22	21	57434	-10	-0.02%		11975.5396	43.1%	15786.2476	56.9%	11976	-	-	1,905	11,976	1,905	10,070	1
23	22	57526	82	0.14%		10690.4804	31.3%	23427.7544	68.7%	10690	-	-	6,369	10,690	6,369	4,322	1
24	23	57476	32	0.06%		13635.6178	38.2%	22075.2003	61.8%	13636	-	-	4,220	13,636	4,220	9,416	1
25	24	57369	-75	-0.13%		13280.3261	39.0%	20808.5018	61.0%	13280	-	-	3,764	13,280	3,764	9,516	1
26	25	57480	36	0.06%		12037.8372	43.1%	15914.2166	56.9%	12038	-	-	1,938	12,038	1,938	10,100	1
27	26	57552	108	0.19%		13046.9993	44.9%	16016.8213	55.1%	13047	-	-	1,485	13,047	1,485	11,562	1
28	27	57191	-253	-0.44%		14123.842	45.6%	16818.4566	54.4%	14124	-	-	1,347	14,124	1,347	12,777	1
29	28	57515	71	0.12%		12121.7139	43.5%	15769.7873	56.5%	12122	-	-	1,824	12,122	1,824	10,298	1
30	29	57300	-144	-0.25%		12296.8427	44.8%	15142.6597	55.2%	12297	-	-	1,423	12,297	1,423	10,874	1
31	30	57407	-37	-0.06%		13378.1271	43.5%	17361.1508	56.5%	13378	-	-	1,992	13,378	1,992	11,387	1
32	31	57429	-15	-0.03%		12697.7324	44.1%	16065.8303	55.9%	12698	-	-	1,684	12,698	1,684	11,014	1
33	32	57349	-95	-0.17%		10675.1056	40.3%	15803.6502	59.7%	10675	-	-	2,564	10,675	2,564	8,111	1
34	33	57391	-53	-0.09%		10631.3859	36.2%	18761.8555	63.8%	10631	-	-	4,065	10,631	4,065	6,566	1
35	34	57651	207	0.36%		12444.2881	39.1%	19352.8481	60.9%	12444	-	-	3,454	12,444	3,454	8,990	1
36	35	57528	84	0.15%		12270.237	44.1%	15525.2659	55.9%	12270	-	-	1,628	12,270	1,628	10,643	1
37	36	57377	-67	-0.12%		10779.0466	40.0%	16160.5373	60.0%	10779	-	-	2,691	10,779	2,691	8,088	1
38	37	57671	227	0.40%		12707.1756	44.0%	16201.9423	56.0%	12707	-	-	1,747	12,707	1,747	10,960	1
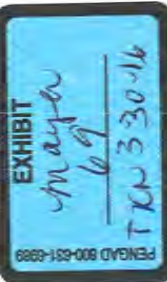
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	District	Pop	Dev	% Dev	Net D	Predicted Dem	D Pct	Predicted Rep	R PCT	D Lost	R Lost	D Surplus	R Surplus	D Wasted	R Wasted	R-D Net	Rep Win
39	38	57572	128	0.22%		12073.2899	38.1%	19590.4496	61.9%	12073	-	-	3,759	12,073	3,759	8,315	1
40	39	57457	13	0.02%		11487.3302	40.1%	17193.6339	59.9%	11487	-	-	2,853	11,487	2,853	8,634	1
41	40	57495	51	0.09%		10890.4982	43.7%	14056.6945	56.3%	10890	-	-	1,583	10,890	1,583	9,307	1
42	41	57671	227	0.40%		11101.1196	42.5%	14993.5389	57.5%	11101	-	-	1,946	11,101	1,946	9,155	1
43	42	57559	115	0.20%		13122.3835	45.2%	15938.793	54.8%	13122	-	-	1,408	13,122	1,408	11,714	1
44	43	57444	0	0.00%		17378.4958	57.1%	13073.4423	42.9%	0	13,073	2,153	-	2,153	13,073	(10,921)	0
45	44	57434	-10	-0.02%		16087.9825	59.9%	10767.7134	40.1%	0	10,768	2,660	-	2,660	10,768	(8,108)	0
46	45	57242	-202	-0.35%		16279.0865	64.8%	8828.47653	35.2%	0	8,828	3,725	-	3,725	8,828	(5,103)	0
47	46	57463	19	0.03%		20287.7304	65.5%	10667.2462	34.5%	0	10,667	4,810	-	4,810	10,667	(5,857)	0
48	47	57494	50	0.09%		21609.2207	69.8%	9340.05885	30.2%	0	9,340	6,135	-	6,135	9,340	(3,205)	0
49	48	57568	124	0.22%		24516.7055	76.3%	7634.69829	23.7%	0	7,635	8,441	-	8,441	7,635	806	0
50	49	57389	-55	-0.10%		11700.5754	45.4%	14098.0156	54.6%	11701	-	-	1,199	11,701	1,199	10,502	1
51	50	57465	21	0.04%		11877.8384	48.2%	12789.106	51.8%	11878	-	-	456	11,878	456	11,422	1
52	51	57247	-197	-0.34%		13574.5804	50.1%	13516.4494	49.9%	0	13,516	29	-	29	13,516	(13,487)	0
53	52	57384	-60	-0.10%		10712.9476	39.9%	16110.6449	60.1%	10713	-	-	2,699	10,713	2,699	8,014	1
54	53	57444	0	0.00%		9716.74136	37.3%	16312.7887	62.7%	9717	-	-	3,298	9,717	3,298	6,419	1
55	54	57443	-1	0.00%		16440.8079	58.0%	11916.4412	42.0%	0	11,916	2,262	-	2,262	11,916	(9,654)	0
56	55	57446	2	0.00%		12032.126	40.8%	17437.201	59.2%	12032	-	-	2,703	12,032	2,703	9,330	1
57	56	57342	-102	-0.18%		12580.3857	40.4%	18554.3848	59.6%	12580	-	-	2,987	12,580	2,987	9,593	1
58	57	57404	-40	-0.07%		15547.4866	59.2%	10736.8985	40.8%	0	10,737	2,405	-	2,405	10,737	(8,332)	0
59	58	57436	-8	-0.01%		8236.17395	26.5%	22901.5135	73.5%	8236	-	-	7,333	8,236	7,333	904	1
60	59	57554	110	0.19%		8189.89807	27.0%	22193.7251	73.0%	8190	-	-	7,002	8,190	7,002	1,188	1
61	60	57547	103	0.18%		9253.34136	27.5%	24431.3049	72.5%	9253	-	-	7,589	9,253	7,589	1,664	1
62	61	57605	161	0.28%		13129.8698	44.4%	16465.99	55.6%	13130	-	-	1,668	13,130	1,668	11,462	1
63	62	57632	188	0.33%		14827.1163	46.1%	17307.1503	53.9%	14827	-	-	1,240	14,827	1,240	13,587	1
64	63	57299	-145	-0.25%		12484.441	42.3%	17056.4235	57.7%	12484	-	-	2,286	12,484	2,286	10,198	1
65	64	57266	-178	-0.31%		16837.4326	61.8%	10408.0565	38.2%	0	10,408	3,215	-	3,215	10,408	(7,193)	0
66	65	57601	157	0.27%		15105.1284	65.6%	7929.21778	34.4%	0	7,929	3,588	-	3,588	7,929	(4,341)	0
67	66	57459	15	0.03%		17217.2726	78.7%	4666.3667	21.3%	0	4,666	6,275	-	6,275	4,666	1,609	0
68	67	57378	-66	-0.11%		13171.6375	46.5%	15144.5047	53.5%	13172	-	-	986	13,172	986	12,185	1
69	68	57254	-190	-0.33%		13095.9933	49.3%	13464.7628	50.7%	13096	-	-	184	13,096	184	12,912	1
70	69	57424	-20	-0.03%		10498.2561	41.5%	14804.5031	58.5%	10498	-	-	2,153	10,498	2,153	8,345	1
71	70	57415	-29	-0.05%		13406.1393	49.9%	13472.0537	50.1%	13406	-	-	33	13,406	33	13,373	1
72	71	57228	-216	-0.38%		17613.5018	60.7%	11382.7702	39.3%	0	11,383	3,115	-	3,115	11,383	(8,267)	0
73	72	57654	210	0.37%		13671.8928	48.7%	14382.004	51.3%	13672	-	-	355	13,672	355	13,317	1
74	73	57491	47	0.08%		18586.3783	65.4%	9839.61713	34.6%	0	9,840	4,373	-	4,373	9,840	(5,466)	0
75	74	57320	-124	-0.22%		18349.3295	58.9%	12810.9174	41.1%	0	12,811	2,769	-	2,769	12,811	(10,042)	0

EG act 43 With Inc

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	District	Pop	Dev	% Dev	Net D	Predicted Dem	D Pct	Predicted Rep	R PCT	D Lost	R Lost	D Surplus	R Surplus	D Wasted	R Wasted	R-D Net	Rep Win
76	75	57255	-189	-0.33%		14379.7058	50.8%	13904.4216	49.2%	0	13,904	238	-	238	13,904	(13,667)	0
77	76	57586	142	0.25%		32328.6553	84.9%	5741.16621	15.1%	0	5,741	13,294	-	13,294	5,741	7,553	0
78	77	57398	-46	-0.08%		28094.3496	84.5%	5145.55133	15.5%	0	5,146	11,474	-	11,474	5,146	6,329	0
79	78	57579	135	0.24%		25321.435	73.8%	8970.02913	26.2%	0	8,970	8,176	-	8,176	8,970	(794)	0
80	79	57341	-103	-0.18%		20752.5857	59.8%	13974.557	40.2%	0	13,975	3,389	-	3,389	13,975	(10,586)	0
81	80	57385	-59	-0.10%		21488.5038	64.7%	11731.3153	35.3%	0	11,731	4,879	-	4,879	11,731	(6,853)	0
82	81	57266	-178	-0.31%		17497.6877	60.5%	11435.9633	39.5%	0	11,436	3,031	-	3,031	11,436	(8,405)	0
83	82	57641	197	0.34%		11560.4948	38.4%	18561.4648	61.6%	11560	-	-	3,500	11,560	3,500	8,060	1
84	83	57612	168	0.29%		9585.59482	28.4%	24224.8499	71.6%	9586	-	-	7,320	9,586	7,320	2,266	1
85	84	57375	-69	-0.12%		11895.1361	38.2%	19241.3817	61.8%	11895	-	-	3,673	11,895	3,673	8,222	1
86	85	57529	85	0.15%		13619.027	51.3%	12926.1337	48.7%	0	12,926	346	-	346	12,926	(12,580)	0
87	86	57477	33	0.06%		13418.6399	43.9%	17150.3939	56.1%	13419	-	-	1,866	13,419	1,866	11,553	1
88	87	57661	217	0.38%		11144.1989	41.7%	15557.0821	58.3%	11144	-	-	2,206	11,144	2,206	8,938	1
89	88	57533	89	0.15%		12568.6014	45.9%	14827.8805	54.1%	12569	-	-	1,130	12,569	1,130	11,439	1
90	89	57490	46	0.08%		11003.4044	40.8%	15991.5684	59.2%	11003	-	-	2,494	11,003	2,494	8,509	1
91	90	57617	173	0.30%		12079.839	62.3%	7309.13835	37.7%	0	7,309	2,385	-	2,385	7,309	(4,924)	0
92	91	57374	-70	-0.12%		18031.9094	60.4%	11828.1865	39.6%	0	11,828	3,102	-	3,102	11,828	(8,726)	0
93	92	57421	-23	-0.04%		15442.3759	59.5%	10527.8232	40.5%	0	10,528	2,457	-	2,457	10,528	(8,071)	0
94	93	57280	-164	-0.29%		14677.1679	48.0%	15895.1691	52.0%	14677	-	-	609	14,677	609	14,068	1
95	94	57509	65	0.11%		18565.999	60.6%	12068.0002	39.4%	0	12,068	3,249	-	3,249	12,068	(8,819)	0
96	95	57496	52	0.09%		21108.9734	71.0%	8628.51263	29.0%	0	8,629	6,240	-	6,240	8,629	(2,388)	0
97	96	57406	-38	-0.07%		10382.496	40.4%	15314.364	59.6%	10382	-	-	2,466	10,382	2,466	7,917	1
98	97	57487	43	0.07%		10240.8951	35.6%	18496.4528	64.4%	10241	-	-	4,128	10,241	4,128	6,113	1
99	98	57485	41	0.07%		9579.01141	30.0%	22327.9739	70.0%	9579	-	-	6,374	9,579	6,374	3,205	1
100	99	57657	213	0.37%		7768.10307	23.0%	25972.7905	77.0%	7768	-	-	9,102	7,768	9,102	(1,334)	1
101																	
102		5686986	30	0.86%		1,452,075		1,390,894		715,219	343,749	196,553	165,963	911,772	509,712	402,060	60
103								48.9%								14.1422%	

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	District	Pop	Dev	% Dev	Net D	Predicted Dem	D Pct	Predicted Rep	R PCT	D Lost	R Lost	D Surplus	R Surplus	D Wasted	R Wasted	R-D Net	Rep Win
2	1	57487	43	0.07%		15632.8269	48.0%	16904.268	52.0%	15633	-	-	636	15,633	636	14,997	1
3	2	57590	146	0.25%		11254.5838	51.8%	10456.7601	48.2%	0	10,457	399	-	399	10,457	(10,058)	0
4	3	57686	242	0.42%		10664.8684	36.9%	18260.2801	63.1%	10665	-	-	3,798	10,665	3,798	6,867	1
5	4	57406	-38	-0.07%		10880.9569	46.0%	12790.0845	54.0%	10881	-	-	955	10,881	955	9,926	1
6	5	57633	189	0.33%		12887.405	47.4%	14322.7574	52.6%	12887	-	-	718	12,887	718	12,170	1
7	6	57480	36	0.06%		11044.5664	38.5%	17627.1437	61.5%	11045	-	-	3,291	11,045	3,291	7,753	1
8	7	57208	-236	-0.41%		24236.7442	72.6%	9130.38019	27.4%	0	9,130	7,553	-	7,553	9,130	(1,577)	0
9	8	57196	-248	-0.43%		7953.47153	87.7%	1111.87306	12.3%	0	1,112	3,421	-	3,421	1,112	2,309	0
10	9	57420	-24	-0.04%		11438.73	69.9%	4914.50533	30.1%	0	4,915	3,262	-	3,262	4,915	(1,652)	0
11	10	57195	-249	-0.43%		25348.4008	88.6%	3269.99845	11.4%	0	3,270	11,039	-	11,039	3,270	7,769	0
12	11	57455	11	0.02%		22374.0788	82.2%	4855.26221	17.8%	0	4,855	8,759	-	8,759	4,855	3,904	0
13	12	57420	-24	-0.04%		20040.8042	83.2%	4038.94033	16.8%	0	4,039	8,001	-	8,001	4,039	3,962	0
14	13	57248	-196	-0.34%		17151.6461	52.4%	15589.9259	47.6%	0	15,590	781	-	781	15,590	(14,809)	0
15	14	57333	-111	-0.19%		13575.3037	49.6%	13798.9054	50.4%	13575	-	-	112	13,575	112	13,464	1
16	15	57514	70	0.12%		13411.8007	47.4%	14900.9089	52.6%	13412	-	-	745	13,412	745	12,667	1
17	16	57282	-162	-0.28%		22329.2316	91.7%	2017.47154	8.3%	0	2,017	10,156	-	10,156	2,017	8,138	0
18	17	57437	-7	-0.01%		21769.4886	85.9%	3568.92922	14.1%	0	3,569	9,100	-	9,100	3,569	5,531	0
19	18	57241	-203	-0.35%		23816.7055	82.8%	4954.47264	17.2%	0	4,954	9,431	-	9,431	4,954	4,477	0
20	19	57313	-131	-0.23%		16310.395	61.9%	10022.558	38.1%	0	10,023	3,144	-	3,144	10,023	(6,879)	0
21	20	57410	-34	-0.06%		13528.8845	50.3%	13362.3184	49.7%	0	13,362	83	-	83	13,362	(13,279)	0
22	21	57434	-10	-0.02%		12257.0496	42.0%	16911.1371	58.0%	12257	-	-	2,327	12,257	2,327	9,930	1
23	22	57526	82	0.14%		19465.2657	58.2%	13965.5231	41.8%	0	13,966	2,750	-	2,750	13,966	(11,216)	0
24	23	57476	32	0.06%		10312.1651	28.4%	25936.8277	71.6%	10312	-	-	7,812	10,312	7,812	2,500	1
25	24	57369	-75	-0.13%		8065.67119	23.4%	26339.0271	76.6%	8066	-	-	9,137	8,066	9,137	(1,071)	1
26	25	57480	36	0.06%		11590.2429	38.3%	18708.7038	61.7%	11590	-	-	3,559	11,590	3,559	8,031	1
27	26	57552	108	0.19%		13250.7189	47.7%	14526.5946	52.3%	13251	-	-	638	13,251	638	12,613	1
28	27	57191	-253	-0.44%		14361.9844	54.1%	12203.2472	45.9%	0	12,203	1,079	-	1,079	12,203	(11,124)	0
29	28	57515	71	0.12%		12023.4985	42.8%	16056.1798	57.2%	12023	-	-	2,016	12,023	2,016	10,007	1
30	29	57300	-144	-0.25%		13569.2582	50.3%	13432.7398	49.7%	0	13,433	68	-	68	13,433	(13,364)	0
31	30	57407	-37	-0.06%		10701.7688	40.6%	15639.3047	59.4%	10702	-	-	2,469	10,702	2,469	8,233	1
32	31	57429	-15	-0.03%		10717.4802	39.3%	16576.2248	60.7%	10717	-	-	2,929	10,717	2,929	7,788	1
33	32	57349	-95	-0.17%		12096.5062	45.9%	14248.3375	54.1%	12097	-	-	1,076	12,097	1,076	11,021	1
34	33	57391	-53	-0.09%		14609.2857	59.0%	10151.3381	41.0%	0	10,151	2,229	-	2,229	10,151	(7,922)	0
35	34	57651	207	0.36%		13139.2444	45.6%	15689.6012	54.4%	13139	-	-	1,275	13,139	1,275	11,864	1
36	35	57528	84	0.15%		10653.1045	38.5%	17000.1323	61.5%	10653	-	-	3,174	10,653	3,174	7,480	1
37	36	57377	-67	-0.12%		10897.2321	41.3%	15482.0653	58.7%	10897	-	-	2,292	10,897	2,292	8,605	1
38	37	57671	227	0.40%		9221.64608	29.3%	22239.8489	70.7%	9222	-	-	6,509	9,222	6,509	2,713	1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	District	Pop	Dev	% Dev	Net D	Predicted Dem	D Pct	Predicted Rep	R PCT	D Lost	R Lost	D Surplus	R Surplus	D Wasted	R Wasted	R-D Net	Rep Win
39	38	57572	128	0.22%		9103.67455	26.3%	25495.8604	73.7%	9104	-	-	8,196	9,104	8,196	908	1
40	39	57457	13	0.02%		10155.3245	36.1%	17989.7533	63.9%	10155	-	-	3,917	10,155	3,917	6,238	1
41	40	57495	51	0.09%		15060.8327	51.9%	13947.4491	48.1%	0	13,947	557	-	557	13,947	(13,391)	0
42	41	57671	227	0.40%		16783.7718	56.1%	13119.5946	43.9%	0	13,120	1,832	-	1,832	13,120	(11,288)	0
43	42	57559	115	0.20%		13253.9832	51.9%	12282.2164	48.1%	0	12,282	486	-	486	12,282	(11,796)	0
44	43	57444	0	0.00%		12658.0827	48.2%	13605.802	51.8%	12658	-	-	474	12,658	474	12,184	1
45	44	57434	-10	-0.02%		17643.3481	63.8%	9993.32701	36.2%	0	9,993	3,825	-	3,825	9,993	(6,168)	0
46	45	57242	-202	-0.35%		17535.0966	58.0%	12682.7745	42.0%	0	12,683	2,426	-	2,426	12,683	(10,257)	0
47	46	57463	19	0.03%		20582.8695	64.3%	11417.913	35.7%	0	11,418	4,582	-	4,582	11,418	(6,835)	0
48	47	57494	50	0.09%		20207.6206	67.1%	9888.16057	32.9%	0	9,888	5,160	-	5,160	9,888	(4,728)	0
49	48	57568	124	0.22%		24456.5006	73.5%	8839.85774	26.5%	0	8,840	7,808	-	7,808	8,840	(1,032)	0
50	49	57389	-55	-0.10%		13624.5542	50.3%	13477.0236	49.7%	0	13,477	74	-	74	13,477	(13,403)	0
51	50	57465	21	0.04%		12289.1198	47.3%	13708.8034	52.7%	12289	-	-	710	12,289	710	11,579	1
52	51	57247	-197	-0.34%		14759.533	52.6%	13323.0986	47.4%	0	13,323	718	-	718	13,323	(12,605)	0
53	52	57384	-60	-0.10%		11777.262	37.2%	19885.3791	62.8%	11777	-	-	4,054	11,777	4,054	7,723	1
54	53	57444	0	0.00%		11783.5899	46.0%	13835.943	54.0%	11784	-	-	1,026	11,784	1,026	10,757	1
55	54	57443	-1	0.00%		15241.087	57.4%	11313.8049	42.6%	0	11,314	1,964	-	1,964	11,314	(9,350)	0
56	55	57446	2	0.00%		12978.7467	45.2%	15758.5986	54.8%	12979	-	-	1,390	12,979	1,390	11,589	1
57	56	57342	-102	-0.18%		12552.6211	46.4%	14517.839	53.6%	12553	-	-	983	12,553	983	11,570	1
58	57	57404	-40	-0.07%		16060.7738	57.0%	12124.5557	43.0%	0	12,125	1,968	-	1,968	12,125	(10,156)	0
59	58	57436	-8	-0.01%		9325.34918	30.6%	21179.7198	69.4%	9325	-	-	5,927	9,325	5,927	3,398	1
60	59	57554	110	0.19%		10960.2822	32.8%	22457.63	67.2%	10960	-	-	5,749	10,960	5,749	5,212	1
61	60	57547	103	0.18%		8152.32448	26.3%	22887.6352	73.7%	8152	-	-	7,368	8,152	7,368	785	1
62	61	57605	161	0.28%		12933.2237	43.8%	16576.4049	56.2%	12933	-	-	1,822	12,933	1,822	11,112	1
63	62	57632	188	0.33%		15180.7607	60.3%	9999.04398	39.7%	0	9,999	2,591	-	2,591	9,999	(7,408)	0
64	63	57299	-145	-0.25%		16785.1052	65.0%	9025.31251	35.0%	0	9,025	3,880	-	3,880	9,025	(5,145)	0
65	64	57266	-178	-0.31%		15088.9978	52.8%	13469.5894	47.2%	0	13,470	810	-	810	13,470	(12,660)	0
66	65	57601	157	0.27%		12127.4371	37.4%	20280.3632	62.6%	12127	-	-	4,076	12,127	4,076	8,051	1
67	66	57459	15	0.03%		17358.5587	75.8%	5541.06931	24.2%	0	5,541	5,909	-	5,909	5,541	368	0
68	67	57378	-66	-0.11%		14721.4568	50.0%	14694.9417	50.0%	0	14,695	13	-	13	14,695	(14,682)	0
69	68	57254	-190	-0.33%		11957.6893	49.7%	12123.6333	50.3%	11958	-	-	83	11,958	83	11,875	1
70	69	57424	-20	-0.03%		17901.9446	59.8%	12022.4833	40.2%	0	12,022	2,940	-	2,940	12,022	(9,083)	0
71	70	57415	-29	-0.05%		19778.8734	63.4%	11409.8182	36.6%	0	11,410	4,185	-	4,185	11,410	(7,225)	0
72	71	57228	-216	-0.38%		15080.6774	52.1%	13883.6643	47.9%	0	13,884	599	-	599	13,884	(13,285)	0
73	72	57654	210	0.37%		10572.1866	38.3%	17018.2106	61.7%	10572	-	-	3,223	10,572	3,223	7,349	1
74	73	57491	47	0.08%		18367.8863	65.1%	9842.14445	34.9%	0	9,842	4,263	-	4,263	9,842	(5,579)	0
75	74	57320	-124	-0.22%		17712.1116	55.5%	14218.6099	44.5%	0	14,219	1,747	-	1,747	14,219	(12,472)	0

EG With Inc

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	District	Pop	Dev	% Dev	Net D	Predicted Dem	D Pct	Predicted Rep	R PCT	D Lost	R Lost	D Surplus	R Surplus	D Wasted	R Wasted	R-D Net	Rep Win
76	75	57255	-189	-0.33%		15186.3326	47.6%	16716.6612	52.4%	15186	-	-	765	15,186	765	14,421	1
77	76	57586	142	0.25%		32317.6744	84.9%	5747.10878	15.1%	0	5,747	13,285	-	13,285	5,747	7,538	0
78	77	57398	-46	-0.08%		27871.2662	84.4%	5168.34768	15.6%	0	5,168	11,351	-	11,351	5,168	6,183	0
79	78	57579	135	0.24%		25577.5609	74.1%	8954.86358	25.9%	0	8,955	8,311	-	8,311	8,955	(644)	0
80	79	57341	-103	-0.18%		20438.5397	60.6%	13294.0525	39.4%	0	13,294	3,572	-	3,572	13,294	(9,722)	0
81	80	57385	-59	-0.10%		21333.2441	66.5%	10759.88	33.5%	0	10,760	5,287	-	5,287	10,760	(5,473)	0
82	81	57266	-178	-0.31%		13112.7704	49.8%	13203.5833	50.2%	13113	-	-	45	13,113	45	13,067	1
83	82	57641	197	0.34%		9286.55333	30.0%	21659.3803	70.0%	9287	-	-	6,186	9,287	6,186	3,100	1
84	83	57612	168	0.29%		8635.95699	26.8%	23548.8893	73.2%	8636	-	-	7,456	8,636	7,456	1,179	1
85	84	57375	-69	-0.12%		11382.7777	32.9%	23175.2776	67.1%	11383	-	-	5,896	11,383	5,896	5,487	1
86	85	57529	85	0.15%		9452.57969	40.9%	13640.7545	59.1%	9453	-	-	2,094	9,453	2,094	7,358	1
87	86	57477	33	0.06%		13233.0431	48.6%	13978.9172	51.4%	13233	-	-	373	13,233	373	12,860	1
88	87	57661	217	0.38%		10774.6455	38.2%	17459.314	61.8%	10775	-	-	3,342	10,775	3,342	7,432	1
89	88	57533	89	0.15%		13623.1119	54.0%	11600.8627	46.0%	0	11,601	1,011	-	1,011	11,601	(10,590)	0
90	89	57490	46	0.08%		13373.5648	45.9%	15770.696	54.1%	13374	-	-	1,199	13,374	1,199	12,175	1
91	90	57617	173	0.30%		10768.1875	37.5%	17923.1895	62.5%	10768	-	-	3,578	10,768	3,578	7,191	1
92	91	57374	-70	-0.12%		14185.6148	49.7%	14332.1951	50.3%	14186	-	-	73	14,186	73	14,112	1
93	92	57421	-23	-0.04%		14906.563	50.5%	14593.5044	49.5%	0	14,594	157	-	157	14,594	(14,437)	0
94	93	57280	-164	-0.29%		11867.6826	39.1%	18505.9811	60.9%	11868	-	-	3,319	11,868	3,319	8,549	1
95	94	57509	65	0.11%		17346.6845	61.5%	10858.6047	38.5%	0	10,859	3,244	-	3,244	10,859	(7,615)	0
96	95	57496	52	0.09%		21071.8927	70.2%	8951.6357	29.8%	0	8,952	6,060	-	6,060	8,952	(2,892)	0
97	96	57406	-38	-0.07%		14665.3278	51.5%	13835.6951	48.5%	0	13,836	415	-	415	13,836	(13,421)	0
98	97	57487	43	0.07%		10886.7343	30.6%	24696.2759	69.4%	10887	-	-	6,905	10,887	6,905	3,982	1
99	98	57485	41	0.07%		9270.21261	26.9%	25238.0631	73.1%	9270	-	-	7,984	9,270	7,984	1,286	1
100	99	57657	213	0.37%		10181.0138	34.2%	19631.1109	65.8%	10181	-	-	4,725	10,181	4,725	5,456	1
101																	
102		5686986	30	0.86%		1,455,846		1,388,087		573,949	497,327	192,285	158,406	766,234	655,733	110,501	50
103								48.8%								3.8855%	

Incumbents

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
	District	Pop	Dev	% Dev	Net D	Dem - Dinc	Rep - Dinc	Dem- Rinc	Rep - Rinc	Predicted Dem	D Pct	Predicted Rep	R PCT	D Lost	R Lost	D Surplus	R Surplus	D Wasted	R Wasted	R-D Net	Rep Win
	1	57487	43	0.07%		17502	15462	15633	16904	15,633	48.0%	16904	52.0%	15633	-	-	636	15,633	636	14,997	1
	2	57590	146	0.25%		12899	9188	11255	10457	12,899	58.4%	9188	41.6%	0	9,188	1,856	-	1,856	9,188	(7,332)	0
	3	57686	242	0.42%		12392	16928	10665	18260	10,665	36.9%	18260	63.1%	10665	-	-	3,798	10,665	3,798	6,867	1
	4	57406	-38	-0.07%		12083	11870	10276	13264	10,276	43.7%	13264	56.3%	10276	-	-	1,494	10,276	1,494	8,782	1
	5	57633	189	0.33%		14709	12917	12887	14323	12,887	47.4%	14323	52.6%	12887	-	-	718	12,887	718	12,170	1
	6	57480	36	0.06%		12189	16751	10469	18078	10,469	36.7%	18078	63.3%	10469	-	-	3,805	10,469	3,805	6,664	1
	7	57208	-236	-0.41%		24237	9130	22110	10771	24,237	72.6%	9130	27.4%	0	9,130	7,553	-	7,553	9,130	(1,577)	0
	8	57196	-248	-0.43%		7953	1112	6809	1995	7,953	87.7%	1112	12.3%	0	1,112	3,421	-	3,421	1,112	2,309	0
	9	57420	-24	-0.04%		11439	4915	10023	6007	11,439	69.9%	4915	30.1%	0	4,915	3,262	-	3,262	4,915	(1,652)	0
	10	57195	-249	-0.43%		26460	2419	24789	3708	26,460	91.6%	2419	8.4%	0	2,419	12,021	-	12,021	2,419	9,602	0
	11	57455	11	0.02%		23453	4029	21831	5281	23,453	85.3%	4029	14.7%	0	4,029	9,712	-	9,712	4,029	5,683	0
	12	57420	-24	-0.04%		21064	3256	19526	4442	21,064	86.6%	3256	13.4%	0	3,256	8,904	-	8,904	3,256	5,648	0
	13	57248	-196	-0.34%		17152	15590	15345	16984	15,345	47.5%	16984	52.5%	15345	-	-	819	15,345	819	14,526	1
	14	57333	-111	-0.19%		14786	12872	12966	14276	12,966	47.6%	14276	52.4%	12966	-	-	655	12,966	655	12,311	1
	15	57514	70	0.12%		14632	13967	12798	15382	12,798	45.4%	15382	54.6%	12798	-	-	1,292	12,798	1,292	11,506	1
	16	57282	-162	-0.28%		22329	2017	20683	3288	22,329	91.7%	2017	8.3%	0	2,017	10,156	-	10,156	2,017	8,138	0
	17	57437	-7	-0.01%		22818	2766	21242	3982	22,818	89.2%	2766	10.8%	0	2,766	10,026	-	10,026	2,766	7,259	0
	18	57241	-203	-0.35%		24917	4112	23263	5388	24,917	85.8%	4112	14.2%	0	4,112	10,403	-	10,403	4,112	6,291	0
	19	57313	-131	-0.23%		16310	10023	14581	11357	16,310	61.9%	10023	38.1%	0	10,023	3,144	-	3,144	10,023	(6,879)	0
	20	57410	-34	-0.06%		15289	12004	13529	13362	15,289	56.0%	12004	44.0%	0	12,004	1,643	-	1,643	12,004	(10,362)	0
	21	57434	-10	-0.02%		13416	16024	11674	17368	11,674	40.2%	17368	59.8%	11674	-	-	2,847	11,674	2,847	8,827	1
	22	57526	82	0.14%		19465	13966	17766	15277	19,465	58.2%	13966	41.8%	0	13,966	2,750	-	2,750	13,966	(11,216)	0
	23	57476	32	0.06%		12134	24531	10312	25937	10,312	28.4%	25937	71.6%	10312	-	-	7,812	10,312	7,812	2,500	1
	24	57369	-75	-0.13%		9861	24954	8066	26339	8,066	23.4%	26339	76.6%	8066	-	-	9,137	8,066	9,137	(1,071)	1
	25	57480	36	0.06%		13349	17352	11590	18709	11,590	38.3%	18709	61.7%	11590	-	-	3,559	11,590	3,559	8,031	1
	26	57552	108	0.19%		14484	13582	12630	15013	12,630	45.7%	15013	54.3%	12630	-	-	1,191	12,630	1,191	11,439	1
	27	57191	-253	-0.44%		16073	10883	14362	12203	16,073	59.6%	10883	40.4%	0	10,883	2,595	-	2,595	10,883	(8,288)	0
	28	57515	71	0.12%		13798	14687	12023	16056	12,023	42.8%	16056	57.2%	12023	-	-	2,016	12,023	2,016	10,007	1
	29	57300	-144	-0.25%		15394	12025	13569	13433	15,394	56.1%	12025	43.9%	0	12,025	1,685	-	1,685	12,025	(10,340)	0
	30	57407	-37	-0.06%		12511	14243	10702	15639	10,702	40.6%	15639	59.4%	10702	-	-	2,469	10,702	2,469	8,233	1
	31	57429	-15	-0.03%		12470	15224	10717	16576	10,717	39.3%	16576	60.7%	10717	-	-	2,929	10,717	2,929	7,788	1
	32	57349	-95	-0.17%		13856	12891	12097	14248	12,097	45.9%	14248	54.1%	12097	-	-	1,076	12,097	1,076	11,021	1
	33	57391	-53	-0.09%		15737	9288	14042	10596	15,737	62.9%	9288	37.1%	0	9,288	3,224	-	3,224	9,288	(6,064)	0
	34	57651	207	0.36%		14406	14720	12502	16189	12,502	43.6%	16189	56.4%	12502	-	-	1,843	12,502	1,843	10,658	1
	35	57528	84	0.15%		12549	15537	10653	17000	10,653	38.5%	17000	61.5%	10653	-	-	3,174	10,653	3,174	7,480	1
	36	57377	-67	-0.12%		12746	14056	10897	15482	10,897	41.3%	15482	58.7%	10897	-	-	2,292	10,897	2,292	8,605	1
	37	57671	227	0.40%		10396	21341	8631	22703	8,631	27.5%	22703	72.5%	8631	-	-	7,036	8,631	7,036	1,594	1
	38	57572	128	0.22%		10915	24098	9104	25496	9,104	26.3%	25496	73.7%	9104	-	-	8,196	9,104	8,196	908	1
	39	57457	13	0.02%		11923	16626	10155	17990	10,155	36.1%	17990	63.9%	10155	-	-	3,917	10,155	3,917	6,238	1
	40	57495	51	0.09%		16265	13026	14455	14422	16,265	55.5%	13026	44.5%	0	13,026	1,620	-	1,620	13,026	(11,406)	0
	41	57671	227	0.40%		18044	12154	16149	13616	18,044	59.8%	12154	40.2%	0	12,154	2,945	-	2,945	12,154	(9,209)	0
	42	57559	115	0.20%		14417	11392	12669	12741	14,417	55.9%	11392	44.1%	0	11,392	1,513	-	1,513	11,392	(9,879)	0
	43	57444	0	0.00%		13783	12744	12092	14049	12,092	46.3%	14049	53.7%	12092	-	-	979	12,092	979	11,113	1
	44	57434	-10	-0.02%		17643	9993	15890	11346	17,643	63.8%	9993	36.2%	0	9,993	3,825	-	3,825	9,993	(6,168)	0
	45	57242	-202	-0.35%		17535	12683	15757	14055	17,535	58.0%	12683	42.0%	0	12,683	2,426	-	2,426	12,683	(10,257)	0

Incumbents

	District	Pop	Dev	% Dev	Net D	Dem - Dinc	Rep - Dinc	Dem- Rinc	Rep - Rinc	Predicted Dem	D Pct	Predicted Rep	R PCT	D Lost	R Lost	D Surplus	R Surplus	D Wasted	R Wasted	R-D Net	Rep Win
						F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
47	46	57463	19	0.03%		21729	10541	20006	11870	21,729	67.3%	10541	32.7%	0	10,541	5,594	-	5,594	10,541	(4,946)	0
48	47	57494	50	0.09%		21292	9058	19662	10316	21,292	70.2%	9058	29.8%	0	9,058	6,117	-	6,117	9,058	(2,941)	0
49	48	57568	124	0.22%		25639	7934	23861	9306	25,639	76.4%	7934	23.6%	0	7,934	8,852	-	8,852	7,934	918	0
50	49	57389	-55	-0.10%		14854	12536	13006	13962	14,854	54.2%	12536	45.8%	0	12,536	1,159	-	1,159	12,536	(11,377)	0
51	50	57465	21	0.04%		13460	12812	11700	14171	11,700	45.2%	14171	54.8%	11700	-	-	1,235	11,700	1,235	10,464	1
52	51	57247	-197	-0.34%		15943	12417	14164	13789	15,943	56.2%	12417	43.8%	0	12,417	1,763	-	1,763	12,417	(10,654)	0
53	52	57384	-60	-0.10%		13567	18505	11777	19885	11,777	37.2%	19885	62.8%	11777	-	-	4,054	11,777	4,054	7,723	1
54	53	57444	0	0.00%		13590	12442	11784	13836	11,784	46.0%	13836	54.0%	11784	-	-	1,026	11,784	1,026	10,757	1
55	54	57443	-1	0.00%		15241	11314	13423	12717	15,241	57.4%	11314	42.6%	0	11,314	1,964	-	1,964	11,314	(9,350)	0
56	55	57446	2	0.00%		14728	14409	12979	15759	12,979	45.2%	15759	54.8%	12979	-	-	1,390	12,979	1,390	11,589	1
57	56	57342	-102	-0.18%		13674	13659	11988	14960	11,988	44.5%	14960	55.5%	11988	-	-	1,486	11,988	1,486	10,502	1
58	57	57404	-40	-0.07%		16061	12125	14311	13475	16,061	57.0%	12125	43.0%	0	12,125	1,968	-	1,968	12,125	(10,156)	0
59	58	57436	-8	-0.01%		10507	20275	8731	21646	8,731	28.7%	21646	71.3%	8731	-	-	6,458	8,731	6,458	2,273	1
60	59	57554	110	0.19%		12767	21064	10960	22458	10,960	32.8%	22458	67.2%	10960	-	-	5,749	10,960	5,749	5,212	1
61	60	57547	103	0.18%		9954	21497	8152	22888	8,152	26.3%	22888	73.7%	8152	-	-	7,368	8,152	7,368	785	1
62	61	57605	161	0.28%		14102	15681	12345	17037	12,345	42.0%	17037	58.0%	12345	-	-	2,346	12,345	2,346	9,999	1
63	62	57632	188	0.33%		16270	9165	14633	10428	16,270	64.0%	9165	36.0%	0	9,165	3,552	-	3,552	9,165	(5,613)	0
64	63	57299	-145	-0.25%		16785	9025	15064	10353	16,785	65.0%	9025	35.0%	0	9,025	3,880	-	3,880	9,025	(5,145)	0
65	64	57266	-178	-0.31%		16220	12603	14520	13916	16,220	56.3%	12603	43.7%	0	12,603	1,808	-	1,808	12,603	(10,795)	0
66	65	57601	157	0.27%		13900	18913	12127	20280	12,127	37.4%	20280	62.6%	12127	-	-	4,076	12,127	4,076	8,051	1
67	66	57459	15	0.03%		17359	5541	15746	6785	17,359	75.8%	5541	24.2%	0	5,541	5,909	-	5,909	5,541	368	0
68	67	57378	-66	-0.11%		16511	13314	14721	14695	16,511	55.4%	13314	44.6%	0	13,314	1,598	-	1,598	13,314	(11,716)	0
69	68	57254	-190	-0.33%		13066	11275	11400	12560	11,400	47.6%	12560	52.4%	11400	-	-	580	11,400	580	10,820	1
70	69	57424	-20	-0.03%		19187	11038	17255	12529	19,187	63.5%	11038	36.5%	0	11,038	4,074	-	4,074	11,038	(6,964)	0
71	70	57415	-29	-0.05%		19779	11410	18098	12707	19,779	63.4%	11410	36.6%	0	11,410	4,185	-	4,185	11,410	(7,225)	0
72	71	57228	-216	-0.38%		16277	12967	14478	14355	16,277	55.7%	12967	44.3%	0	12,967	1,655	-	1,655	12,967	(11,313)	0
73	72	57654	210	0.37%		12389	15616	10572	17018	10,572	38.3%	17018	61.7%	10572	-	-	3,223	10,572	3,223	7,349	1
74	73	57491	47	0.08%		18368	9842	16517	11270	18,368	65.1%	9842	34.9%	0	9,842	4,263	-	4,263	9,842	(5,579)	0
75	74	57320	-124	-0.22%		18962	13262	17083	14711	18,962	58.8%	13262	41.2%	0	13,262	2,850	-	2,850	13,262	(10,412)	0
76	75	57255	-189	-0.33%		15186	16717	13255	18207	13,255	42.1%	18207	57.9%	13255	-	-	2,476	13,255	2,476	10,779	1
77	76	57586	142	0.25%		32318	5747	30229	7358	32,318	84.9%	5747	15.1%	0	5,747	13,285	-	13,285	5,747	7,538	0
78	77	57398	-46	-0.08%		27871	5168	26123	6517	27,871	84.4%	5168	15.6%	0	5,168	11,351	-	11,351	5,168	6,183	0
79	78	57579	135	0.24%		25578	8955	23827	10306	25,578	74.1%	8955	25.9%	0	8,955	8,311	-	8,311	8,955	(644)	0
80	79	57341	-103	-0.18%		21612	12396	19848	13757	21,612	63.6%	12396	36.4%	0	12,396	4,608	-	4,608	12,396	(7,788)	0
81	80	57385	-59	-0.10%		21333	10760	19598	12099	21,333	66.5%	10760	33.5%	0	10,760	5,287	-	5,287	10,760	(5,473)	0
82	81	57266	-178	-0.31%		14876	11843	13113	13204	14,876	55.7%	11843	44.3%	0	11,843	1,516	-	1,516	11,843	(10,327)	0
83	82	57641	197	0.34%		11033	20312	9287	21659	9,287	30.0%	21659	70.0%	9287	-	-	6,186	9,287	6,186	3,100	1
84	83	57612	168	0.29%		10443	22154	8636	23549	8,636	26.8%	23549	73.2%	8636	-	-	7,456	8,636	7,456	1,179	1
85	84	57375	-69	-0.12%		13195	21777	11383	23175	11,383	32.9%	23175	67.1%	11383	-	-	5,896	11,383	5,896	5,487	1
86	85	57529	85	0.15%		11172	12314	9453	13641	9,453	40.9%	13641	59.1%	9453	-	-	2,094	9,453	2,094	7,358	1
87	86	57477	33	0.06%		15084	12551	13233	13979	15,084	54.6%	12551	45.4%	0	12,551	1,267	-	1,267	12,551	(11,284)	0
88	87	57661	217	0.38%		12516	16116	10775	17459	10,775	38.2%	17459	61.8%	10775	-	-	3,342	10,775	3,342	7,432	1
89	88	57533	89	0.15%		15372	10251	13623	11601	15,372	60.0%	10251	40.0%	0	10,251	2,560	-	2,560	10,251	(7,691)	0
90	89	57490	46	0.08%		14562	14861	12775	16239	12,775	44.0%	16239	56.0%	12775	-	-	1,732	12,775	1,732	11,044	1
91	90	57617	173	0.30%		12504	16584	10768	17923	10,768	37.5%	17923	62.5%	10768	-	-	3,578	10,768	3,578	7,191	1

Incumbents

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	District	Pop	Dev	% Dev	Net D	Dem - Dinc	Rep - Dinc	Dem- Rinc	Rep - Rinc	Predicted Dem	D Pct	Predicted Rep	R PCT	D Lost	R Lost	D Surplus	R Surplus	D Wasted	R Wasted	R-D Net	Rep Win
92	91	57374	-70	-0.12%		16043	12899	14186	14332	16,043	55.4%	12899	44.6%	0	12,899	1,572	-	1,572	12,899	(11,327)	0
93	92	57421	-23	-0.04%		16130	13657	14291	15076	16,130	54.2%	13657	45.8%	0	13,657	1,237	-	1,237	13,657	(12,420)	0
94	93	57280	-164	-0.29%		13580	17184	11868	18506	11,868	39.1%	18506	60.9%	11868	-	-	3,319	11,868	3,319	8,549	1
95	94	57509	65	0.11%		17347	10859	15579	12222	17,347	61.5%	10859	38.5%	0	10,859	3,244	-	3,244	10,859	(7,615)	0
96	95	57496	52	0.09%		21072	8952	19113	10463	21,072	70.2%	8952	29.8%	0	8,952	6,060	-	6,060	8,952	(2,892)	0
97	96	57406	-38	-0.07%		15841	12936	14074	14299	15,841	55.0%	12936	45.0%	0	12,936	1,452	-	1,452	12,936	(11,483)	0
98	97	57487	43	0.07%		12696	23300	10887	24696	10,887	30.6%	24696	69.4%	10887	-	-	6,905	10,887	6,905	3,982	1
99	98	57485	41	0.07%		11044	23869	9270	25238	9,270	26.9%	25238	73.1%	9270	-	-	7,984	9,270	7,984	1,286	1
100	99	57657	213	0.37%		11979	18244	10181	19631	10,181	34.2%	19631	65.8%	10181	-	-	4,725	10,181	4,725	5,456	1
101																					
102		5686986	30	0.86%						1,484,631		1,366,132		537,937	491,446	227,624	168,375	765,561	659,821	105,740	48
103				3.71%																	

Kenneth Mayer Consulting, LLC
7105 Longmeadow Rd
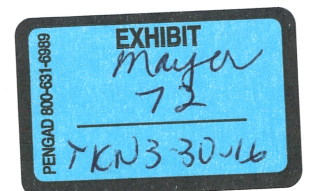**Madison, WI 53717**

INVOICE

Chicago Lawyers' Committee for Civil Rights Under Law
100 N. LaSalle St.
Suite 600
Chicago, IL 60602

Invoice Date: 1-Dec-15

Client   Chicago Lawyer's Committee for Civil Rights Under Law
Dates of Services November 1-November 30, 2015

Amount Due $4,500.00
Due Date   Net 10 days

Date	Description	Hours
3-Nov	Deposition preparation	1.75
5-Nov	Deposition preparation	1.25
6-Nov	Deposition preparation	1.75
7-Nov	Deposition preparation	2.25
8-Nov	Deposition preparation	3.5
9-Nov	Deposition	3.5
29-Nov	Deposition Transcript review	1

	Total Hours	15
	Hourly Rate	$300
	Subtotal	$4,500
	Other Expenses	$ -
	Total	**$ 4,500**

Kenneth Mayer Consulting, LLC
7105 Longmeadow Rd
Madison, WI 53717

INVOICE   Chicago Lawyers' Committee for Civil Rights Under Law
               100 N. LaSalle St.
               Suite 600
               Chicago, IL 60602

Invoice Date: 2-Nov-15

Client   Chicago Lawyer's Committee for Civil Rights Under Law
Dates of Services   October 1-October 31, 2015

Amount Due $1,650.00
Due Date   Net 10 days

Date	Description	Hours
20-Oct	Discovery preparation	0.75
21-Oct	Discovery preparation	3.5
22-Oct	Discovery preparation	1.25

	Total Hours	5.5
	Hourly Rate	$300
	Subtotal	$1,650
	Other Expenses	$ -
	Total	$ 1,650

Kenneth Mayer Consulting, LLC
7105 Longmeadow Rd
Madison, WI 53717

INVOICE	Chicago Lawyers' Committee for Civil Rights Under Law 100 N. LaSalle St. Suite 600 Chicago, IL 60602

Invoice Date:	4-Jan-16
Client	Chicago Lawyer's Committee for Civil Rights Under Law
Dates of Services	December 1- December 31, 2015
Amount Due	$15,225.00
Due Date	Net 10 days

Date	Description	Hours
3-Dec	Report Review	0.75
4-Dec	Phone call Stephonopoulos	0.5
6-Dec	Report Review	0.75
7-Dec	Report Review	1.5
8-Dec	Report Review	3.25
9-Dec	Report review	2.75
10-Dec	phone call Greenwood Strauss Earle	1.25
	Report review	2.5
11-Dec	Rebuttal preparation	1.25
12-Dec	Rebuttal Preparation	1.25
13-Dec	Rebuttal Preparation	4.25
14-Dec	Rebuttal Preparation	3.75
15-Dec	Rebuttal Preparation	0.75
16-Dec	Deposition Review	1.5
17-Dec	Rebuttal Preparation	4.25
18-Dec	Rebuttal Preparatiion	8.5
19-Dec	Rebuttal Preparation	8.25
20-Dec	Rebuttal Preparation	2.5
21-Dec	Rebuttal Preparation	1.25

Total Hours	50.75
Hourly Rate	$300
Subtotal	$15,225
Other Expenses	$ -
Total	**$15,225**