

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

\* \* \* \* \*

WILLIAM WHITFORD, et al.,

Plaintiffs,

v.

Case No. 15-CV-421-bbc

GERALD NICHOL, et al.,

Defendants.

\* \* \* \* \*

DEPOSITION OF SIMON D. JACKMAN, Ph.D.

Friday, November 20, 2015

9:02 a.m.

Reported by: MARY L. MIXON

1 DEPOSITION of SIMON D. JACKMAN, Ph.D., a  
2 witness in the above-entitled action, taken at the  
3 instance of the Defendants, under the provisions of  
4 the Federal Rules of Civil Procedure, taken pursuant  
5 to notice, before MARY L. MIXON, a Court Reporter and  
6 Notary Public in and for the State of Wisconsin, at  
7 the Wisconsin Department of Justice, 17 West Main  
8 Street, in the City of Madison, County of Dane, and  
9 State of Wisconsin, on the 20th day of November 2015,  
10 commencing at 9:02 a.m.

11  
12 \* \* \* \* \*

13 A P P E A R A N C E S

14  
15 PAUL STRAUSS, RUTH GREENWOOD and ANNABELLE  
16 HARLESS, CHICAGO LAWYERS' COMMITTEE FOR  
17 CIVIL RIGHTS UNDER LAW, INC.,  
18 Attorneys at Law,  
100 North La Salle Street, Suite 600,  
Chicago, Illinois 60602, appearing  
on behalf of the Plaintiffs.

19 BRIAN P. KEENAN,  
20 Assistant Attorney General,  
21 WISCONSIN DEPARTMENT OF JUSTICE,  
17 West Main Street,  
Madison, Wisconsin 53703, appearing  
on behalf of the Defendants.

22  
23 PETER G. EARLE,  
24 LAW OFFICE OF PETER EARLE, LLC,  
25 Attorneys at Law,  
839 North Jefferson Street, Suite 300,  
Milwaukee, Wisconsin 53202-3744,  
appearing on behalf of the Witness.

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I N D E X

Examination By:	Page(s)
Attorney Keenan	4

\* \* \* \* \*

E X H I B I T S

Exhibit Nos.:	Page:
11 - Assessing the Current Wisconsin State Legislative Districting Plan 7/7/15 report	6
12 - Curriculum Vitae	7
13 - 11/5/14 engagement letter	12
14 - Invoices	13

\* \* \* \* \*

(Attached to original transcript  
and copies provided to counsel)

\* \* \* \* \*

(Original transcript is filed with Attorney Keenan)

1                   SIMON D. JACKMAN, Ph.D.,  
2                   called as a witness, being first duly sworn,  
3                   testified under oath as follows:  
4

5                   EXAMINATION

6 By Mr. Keenan:

7 Q    Good morning, Professor Jackman. My name is Brian  
8           Keenan, I'm the attorney for the defendants in  
9           this case and we're here for your deposition.  
10          Have you ever been deposed before?

11 A    No.

12 Q    Okay. Well, it's the first time so I'll give you  
13          a few ground rules.

14 A    Okay.

15 Q    I'll be asking you questions and you'll be giving  
16          me answers. And do you understand that you're  
17          under oath?

18 A    I do.

19 Q    And another thing is you have to answer verbally  
20          so that the court reporter here can take down your  
21          answers. Another thing is to just let me get my  
22          whole question out and then you can give your  
23          answer, and I'll try to not talk over you before  
24          my next question. So you understand that you've  
25          sworn to tell the truth to my questions to the

1 best of your ability?

2 A Yes.

3 Q If ever you don't understand a question just let  
4 me know, and I'll be happy to rephrase it or we  
5 can have the court reporter read it out loud  
6 again. Do you understand?

7 A I do.

8 Q We can take some breaks, so if ever you feel like  
9 you have to go to the bathroom or something, just  
10 let me know and we'll take a break. I will say if  
11 there's a pending question, you'll have to answer  
12 the question and then you can take a break.

13 A I understand.

14 Q What did you do to prepare for the deposition  
15 today?

16 A In addition to writing the report, we did a few  
17 phone calls with the team here and we had a  
18 day-long meeting here yesterday.

19 Q And who all was at that meeting yesterday?

20 A Everybody you see to my right here with the  
21 exception of Emma down at the end of the table.

22 Q And how long do you think that meeting lasted?

23 A About four and a half hours.

24 Q Okay. I'm just going to mark some documents as  
25 exhibits and we'll refer to them.

1 A You bet.

2 MR. KEENAN: I was going to  
3 continuously mark exhibits. So we had left  
4 off at 10, so I was going to mark the first  
5 one as 11.

6 MR. STRAUSS: That's a great idea.

7 MR. EARLE: So we're going to do  
8 this consistently through the whole case?

9 MR. KEENAN: I'd be happy with  
10 that.

11 MR. EARLE: Okay, go ahead.  
12 Sometimes people do that, they start that way  
13 and then they switch, and things get  
14 complicated when that happens.

15 MR. KEENAN: Yeah. So we'll mark  
16 this as No. 11.

17 (Exhibit 11 is marked for identification)

18 Q So for Exhibit 11, perhaps you could just identify  
19 what Exhibit 11 is for us.

20 A It's the report I produced at the request of the  
21 plaintiffs.

22 Q Okay. And so keep that handy. I'm actually going  
23 to go on to some other things, but it made more  
24 sense to mark this as the first exhibit at this  
25 deposition. So I've got another one.

1 (Exhibit 12 is marked for identification)

2 Q And if you could identify what Exhibit 12 is for  
3 us?

4 A It's a copy of my curriculum vita dated  
5 May 11, 2015.

6 Q And is this a current version of your CV?

7 A Current as of May, but yeah, there are no  
8 substantial changes.

9 Q All right. So if I wanted to get your educational  
10 history and the jobs you've had, if I look at  
11 what's listed here in Exhibit 12, that would tell  
12 me all that information?

13 A That's correct.

14 Q Okay. So I don't think we need to have you repeat  
15 what's already on this page, so that's why I did  
16 that.

17 A Okay.

18 MR. EARLE: In deference to the  
19 snow, that's a good idea.

20 MR. KEENAN: Yeah.

21 Q What is your current position right now?

22 A I'm a professor of political science at Stanford  
23 University.

24 Q Okay. And what do you do in that position?

25 A I teach classes in the Department of Political

1 Science, I'm a researcher, and a reasonable amount  
2 of administrative responsibilities as well that  
3 accompany a professorial position.

4 Q What classes do you teach?

5 A Primarily statistical methods for master's and  
6 Ph.D. students in the Department of Political  
7 Science.

8 Q And then you said primarily; are there any other  
9 classes you teach outside of --

10 A Yeah, and American politics are the other classes  
11 I teach.

12 Q Any specific classes in American politics?

13 A Elections, public opinion are the topics in  
14 American politics that recent teaching has  
15 covered.

16 Q And you said you're a researcher; what are the  
17 topics that you've researched?

18 A Most recently I've been directing the American  
19 National Election Studies, but over my career I've  
20 done a lot of work on electoral systems, on the  
21 application of statistical methods in many realms  
22 of political science but again with a heavy  
23 emphasis on American politics.

24 Q You mentioned the American National Elections  
25 Studies.



1 A Uh-huh.

2 Q What is that organization?

3 A Okay, sure. That is a large survey-based study of  
4 American political attitudes. It is the single  
5 biggest piece of political science funded by the  
6 National Science Foundation. It's a study that  
7 has been in existence in one form or another since  
8 1952 and is currently a co-production of Stanford  
9 University and the University of Michigan.

10 Q And then I see on your CV that it says principal  
11 investigator; is that your title?

12 A Yeah. For the purposes of that project, that is  
13 my title.

14 Q And then what are your responsibilities as the  
15 principal investigator?

16 A Stewardship of the NSF grant dollars, making  
17 decisions about the science that we're conducting,  
18 the design of given presidential cycles, survey  
19 work, the dissemination of the data, the extent to  
20 which we rely on our Advisory Board for  
21 assistance, directing a small staff at Stanford  
22 and partnering with our opposite numbers at the  
23 University of Michigan.

24 Q And then I see that there's a website listed here,  
25 [www.electionstudies.org](http://www.electionstudies.org); is that the website for

1 the American National Election Studies?

2 A It is, yeah. That's hosted out of the University  
3 of Michigan.

4 Q Have you ever served as an expert witness in a  
5 legal case before?

6 A No.

7 Q All right. When did you start working as an  
8 expert in this case?

9 A Late last year.

10 Q And how did it come about that you ended up  
11 getting involved with this case?

12 A I don't exactly recall, but I believe it was I  
13 think Ruth Greenwood e-mailed me and asked me if  
14 I'd be interested in coming on board, either Ruth  
15 or Nick Stephanopoulos.

16 Q And during that initial contact with you, what was  
17 it suggested that you would do on behalf of the  
18 plaintiffs in this case?

19 A Would I look at the properties of this measure  
20 that McGhee and Stephanopoulos had written about  
21 in a Law Review article, examine its -- generate  
22 measures of the efficiency gap for a large set of  
23 state legislative elections, as many as we could  
24 possibly manage, examining the properties of that  
25 measure, examining some of the ways we might go

1 about computing it, examining the robustness of  
2 the resulting estimates of the efficiency gap and  
3 ultimately to produce an assessment of the extent  
4 to which recent values of the efficiency gap from  
5 Wisconsin, how they stacked up against that -- in  
6 light of that historical analysis.

7 Q You used the term "robustness" which is a term  
8 I've seen. Could you explain what you mean by  
9 that?

10 A Yeah. A simple definition might be the extent to  
11 which you get the same answer when you do  
12 different things and make different assumptions  
13 about the way you treat the data.

14 Q And you also mentioned a Law Review article by  
15 McGhee and Stephanopoulos. At the time you had  
16 first been --

17 MR. EARLE: Excuse me, did you say  
18 large?

19 MR. KEENAN: Law Review.

20 MR. EARLE: Oh, Law Review, okay.

21 I thought you said large. I'm sorry, go  
22 ahead.

23 Q Law Review article by McGhee and Stephanopoulos.  
24 At the time you were approached to work on this  
25 case, were you already familiar with that Law

1 Review article?

2 A No, I was not.

3 Q Were you familiar with the, not the specific  
4 article, with the efficiency gap measure that was  
5 outlined in the article?

6 A No.

7 (Exhibit 13 is marked for identification)

8 Q Could you identify what Exhibit 13 is?

9 A It's my letter of engagement.

10 Q For your work in this case?

11 A Uh-huh.

12 Q All right. I think the copy that I received from  
13 your attorneys doesn't have your signature on it,  
14 but is this still the engagement letter even  
15 though it doesn't look like it has your signature  
16 on it?

17 A Yes.

18 Q You're not disputing that it's the engagement  
19 letter?

20 A No, no.

21 Q All right. And then looking at the engagement  
22 letter, is it your understanding that this  
23 encapsulates what you were asked to do in this  
24 case?

25 A Uh-huh.

1 Q And if you look at the second page, there's a  
2 series of numbers. The number 3 you can see, it's  
3 italicized, it says Partisan Gerrymandering and  
4 the Efficiency Gap, 82 U.Chi.L.Rev. Is that the  
5 Stephanopoulos and McGhee article you were  
6 referencing?

7 A Yes, that's right.

8 Q Okay, let's put that aside. And then your rate is  
9 \$250 per hour; is that correct?

10 A That's correct.

11 (Exhibit 14 is marked for identification)

12 Q And perhaps I should back up. You understood that  
13 you were supposed to produce documents in your  
14 possession to your attorney that then would be  
15 produced to me, correct?

16 A Yes.

17 Q And you produced all the materials that you relied  
18 on in formulating your report to your attorneys,  
19 correct?

20 A Yes, I did.

21 Q All right. When I went through those materials, I  
22 found these two invoices which are contained in  
23 Exhibit 14.

24 A Uh-huh.

25 Q And my main question is are these the only two

1 invoices you've submitted to the plaintiffs in the  
2 case?

3 A That's correct.

4 Q And the first invoice is dated June 8th, 2015.  
5 And if I understand that correctly, that would  
6 cover all of the work you did from whenever the  
7 first engagement was up until that date?

8 A That's correct.

9 Q And then have the plaintiffs paid the invoices  
10 that you submitted to them?

11 A Yes.

12 Q Are there any other outstanding invoices, not  
13 invoices I guess, but any outstanding work that  
14 you haven't billed yet to the plaintiffs?

15 A Yes.

16 Q Okay. And do you have any estimate of how much  
17 that is?

18 A Ten to 12 hours.

19 Q Okay. But you will be submitting an invoice for  
20 that to the plaintiffs?

21 A I will.

22 Q All right. So now we can get back to your report.  
23 You can maybe have Exhibit 11 in front of you.

24 A Uh-huh.

25 Q And I thought I would just go through the report

1 and ask you questions about it.

2 A Okay.

3 Q And the way it's organized, it has an introduction  
4 section and then some more detail behind. So I  
5 thought maybe we could start with the introduction  
6 but then perhaps jump to the substance later and  
7 then we might have to jump back and forth.

8 MR. EARLE: Why don't we -- okay.

9 MS. GREENWOOD: Yeah, just let

10 Simon look on his own copy there.

11 MR. EARLE: Okay.

12 Q So I understand you have your own copy.

13 A Yeah.

14 Q But I believe it's the same document.

15 A It is the same document, right.

16 Q All right. If you look at No. 3, Section 3 is the  
17 Summary.

18 A Uh-huh.

19 Q Start with Paragraph 1 there.

20 A Uh-huh.

21 MR. EARLE: Can we pause for a  
22 second?

23 MR. KEENAN: Sure.

24 (Discussion off the record)

25 Q So just looking at that first paragraph,

1 Paragraph 1, the second sentence says, "Wasted  
2 votes are votes for a party in excess of what the  
3 party needed to win a given district or votes cast  
4 for a party in districts that the party doesn't  
5 win."

6 Where did you get that definition of wasted  
7 votes from?

8 A From McGhee and Stephanopoulos.

9 Q And what's your understanding of -- did McGhee and  
10 Stephanopoulos, I guess for lack of a better word,  
11 create this wasted votes measure?

12 A I think the concept of wasted votes is well  
13 rehearsed in the literature. I think it's given  
14 an extremely precise definition here, but I think  
15 the concept itself is well known in the literature  
16 on partisan gerrymandering.

17 Q And then continue on, "Differences in wasted vote  
18 rates between political parties measure the extent  
19 of partisan gerrymandering."

20 Why is it your opinion that differences in  
21 wasted votes measure the extent of partisan  
22 gerrymandering?

23 A Because fundamentally differences in wasted vote  
24 rates between parties are measuring the extent to  
25 which district lines are systematically treating



1 voters of different parties unequally.

2 Q And is it your opinion that any districting system  
3 that systematically treats voters of different  
4 parties unequally is a product of gerrymandering?

5 A No. I think very specifically it's through the  
6 districting or it's the districting that generates  
7 that unequal treatment. You know, there are other  
8 ways an electoral system might treat voters  
9 unequally. But this is a very precise meaning in  
10 this context, and it's with respect to the  
11 districts and the district boundaries.

12 Q Okay. So any decision on districting that treats  
13 voters of different parties unequally would be  
14 considered gerrymandering?

15 MR. EARLE: I'm going to object to  
16 the form of the question and to the extent  
17 that you're asking him for a legal  
18 conclusion. Subject to that objection, you  
19 can answer the question if you understand it.

20 A Yeah. Could you repeat the question then?

21 Q Sure. Is it your opinion that any districting  
22 decision that results in districts that treat  
23 voters of different parties unequally constitutes  
24 gerrymandering?

25 MR. EARLE: Same objection, go

1 ahead.

2 A The word "treat" in that sentence is key and  
3 perhaps subject to a little ambiguity. I think if  
4 operationally the plan, the districting plan  
5 produces differences in wasted vote rates of the  
6 sort that I elaborate in this report, then we're  
7 on the road to establishing partisan  
8 gerrymandering.

9 Q And did you say you're on the road to establishing  
10 partisan gerrymandering?

11 A Uh-huh.

12 Q That's a yes?

13 A Yes.

14 Q Sorry. But does the just difference in wasted  
15 votes alone establish partisan gerrymandering?

16 MR. EARLE: Same objection. I'll  
17 just note that for the record without  
18 repeating and elaborating on it, but go ahead  
19 and answer the question if you understand the  
20 question.

21 A From my perspective, absent any data about the  
22 intent of people who were drawing the lines,  
23 that's why I got hung up on the word treat in your  
24 earlier question. But the data I observe and in  
25 particular the data I had at my disposal for this

1 report, differences in wasted vote rates was the  
2 indicator that I relied on to measure partisan  
3 gerrymandering.

4 Q I guess I'm just trying to figure out why rely on  
5 that as your indicator?

6 A Because it's available in such a wide array of  
7 states and years and made possible the analysis  
8 that I did.

9 Q And your analysis, just kind of following up on  
10 your prior answer, is based solely on the end  
11 results of the various elections in the states you  
12 measured?

13 MR. EARLE: I'm going to object to  
14 the form of the question, ambiguous.

15 A Okay. Could you repeat the question?

16 Q Sure. You mentioned that you were just looking at  
17 the results of the elections and didn't look at  
18 the intent of any of the bodies that were doing  
19 any of the districting; that's correct?

20 A Yes, in large effect. The one additional piece of  
21 data that I did have at my disposal was, you know,  
22 under which plan an election took place. But I  
23 didn't take into account who drew the plan, and I  
24 have no room to measure this to whatever was in  
25 their minds when they draw the plan.

1 Q Yeah. And so your analysis just looks at what the  
2 results of those plans were in the various  
3 elections that took place under those plans?

4 A Yes.

5 Q Okay. I was just going to skip ahead to --  
6 actually maybe we'll just go to No. 2, Paragraph 2  
7 where it says, "The efficiency gap, EG, is a  
8 relative, wasted vote measure, the ratio of one  
9 party's wasted vote rate to the other party's  
10 wasted vote rate."

11 A Uh-huh.

12 Q And I think we've talked about this before, but  
13 you got this definition of the efficiency gap from  
14 the Stephanopoulos and McGhee article; is that  
15 correct?

16 A That's right.

17 Q Have you written any articles that were published  
18 about the efficiency gap?

19 A No.

20 Q And then you say in No. 3 that, "The efficiency  
21 gap is an excess seats measure reflecting the  
22 nature of a partisan gerrymander."

23 When you say excess seats, excess in  
24 comparison to what?

25 A An efficiency gap of zero and an assumption that

1       there's an equal number of voters in every  
2       district. Under those two assumptions, we have a  
3       very precise relationship between statewide vote  
4       share and seat share for a given party. And it's  
5       with respect to that very precise relationship  
6       that I'm using the term excess seats. So it's  
7       with reference to a world, hypothetical world in  
8       which the efficiency gap is zero, all right.  
9       Against that standard we can assess what happens  
10      in real world elections, the extent to which the  
11      seats won given the votes won is above or below  
12      the level that the zero efficiency gap standard  
13      would imply.

14    Q   And you said that it assumes that there's equal  
15       voters in each district. Can you just explain  
16       what that means?

17    A   Right. That's a simplification that generates a  
18       very simple representation of the mapping from  
19       votes to seats when the efficiency gap is zero.  
20       So if we were able or willing to make the  
21       assumption that there were equal number of voters  
22       in every district and if the efficiency gap was a  
23       preset value, let's say zero for the sake of  
24       argument, then we have an expectation as to how  
25       many seats we should see for a given level of vote

1 -- statewide vote. Now, the equal number of  
2 voters per seat means just that, that in every  
3 district we have the same number of people voting.

4 Q And the same number of people voting would be the  
5 total votes, not the number of people that live in  
6 the district?

7 A That's correct.

8 Q Okay. So it assumed that District 1, 20,000  
9 people voted and District 2, 20,000 people voted,  
10 all the way down the line?

11 A That's right.

12 Q Okay. I'm just going to jump ahead a little bit  
13 and we can get into these things in a little more  
14 detail.

15 A Uh-huh.

16 Q Looking at Figure 1 which is on Page 7.

17 A Uh-huh.

18 Q The exhibit is in color, so if that's a little --

19 A Yeah, that is helpful.

20 Q I printed it in black and white and realized it  
21 didn't make much sense, so then I printed it in  
22 color.

23 MR. EARLE: We need to increase the  
24 budget of the AG's office and have a color  
25 printer.

1 MR. KEENAN: No, I have color.

2 MR. EARLE: Oh, this is my copy.

3 MR. KEENAN: Yeah, his is in black  
4 and white.

5 MR. EARLE: Oh, I see. Oh, it is.

6 MR. KEENAN: Yeah, the official one  
7 is in color. There's some of these graphs  
8 that --

9 MR. EARLE: Okay. Page 7, got it.

10 Q And now that we have the color version, the red, I  
11 take it the red line there is Wisconsin; is that  
12 correct?

13 A That is the average of the efficiency gap measures  
14 for Wisconsin 2012 and Wisconsin 2014.

15 Q And you say average, so that would be?

16 A It's just the average of two numbers.

17 Q Two numbers. And then the bar is there, there's a  
18 dot in the middle and then there's bars on the  
19 side. What does that line represent?

20 A In this graph the horizontal lines are 95 percent  
21 confidence intervals around each average.

22 Q Okay. So the right most, for example, line is the  
23 furthest -- I'm just trying to figure out if  
24 that's actually your calculation of the efficiency  
25 gap for I guess what would be the most favorable

1 democratic year in a plan or does that extend even  
2 further right based on some sort of confidence  
3 interval?

4 MR. EARLE: I'm going to object to  
5 the form of the question. I think I know  
6 what you're asking, but answer the question  
7 if you understand it.

8 A That's not the interpretation I would give --

9 Q Okay. Why don't you explain what you would give?

10 MR. EARLE: Let him finish his  
11 sentence.

12 MR. KEENAN: Sure.

13 MR. EARLE: There you go.

14 A The right most edge or the limit at the end there  
15 of the red horizontal line is the point at which  
16 there is only a 2.5 percent chance that the  
17 average efficiency gap lies to the right of that  
18 point. And similarly there is only a 2.5 percent  
19 chance that the average efficiency gap score for  
20 Wisconsin 2012, 2014 lies to the left of the  
21 left-hand end of the red line. So the single  
22 point estimate is the dot that is unknown -- our  
23 uncertainty about that point estimate is  
24 concentrated around that red dot, and the line is  
25 giving a graphical summary of how large that



1           uncertainty is.

2       Q    And I'll just follow that up.  So in Wisconsin in  
3           this red line, there's only two efficiency gap  
4           calculations, correct?

5       A    That's right.

6       Q    And so later on you give what those are for  
7           Wisconsin.  And I guess I might be phrasing this  
8           poorly but, for example, if you put two dots at  
9           where your calculation for the efficiency gap for  
10          2012 and 2014 --

11      A    That's correct.

12      Q    -- would those be inside the outermost edges there  
13           or would they be at the outermost edges there?

14      A    The individual estimates for each year lie on  
15           either side of the average, right, so the average  
16           by definition will be in the middle.  And since we  
17           only have two, the 2012 estimate will be on one  
18           side and the 2014 estimate will be on the other.  
19           In this case the 2012 estimate is to the left and  
20           the 2014 estimate is to the right.  Just looking  
21           at my numbers, the individual point estimates for  
22           2012 and 2014, the 2012 estimate would lie on that  
23           red line, and the 2014 estimate, yes, probably  
24           does as well, probably right up towards the  
25           right-hand edge, the right-hand end of that red

1 horizontal line.

2 Q Okay. And I guess I was trying to be a little bit  
3 simpler in that those two numbers, we have two and  
4 then we have an average. If we had bigger dots to  
5 represent the 2012 and 2014 numbers, would they  
6 lie at the very extreme of this red line or would  
7 they be somewhat inside of it?

8 A They'd be as I just said, one would be towards the  
9 left-hand end but still on that line, and the  
10 other would be towards the end but I think still  
11 -- it would still be on the red line.

12 MR. EARLE: Just so the record is  
13 clear, the deponent was referencing  
14 Figure 35.

15 A I was eyeballing, literally sort of doing the  
16 transposition, picking up those two estimates  
17 there at the end of Figure 35 and plunking them  
18 down on Figure 1.

19 MR. EARLE: And for the ease of  
20 anybody reading the transcript, Figure 35 is  
21 on Page 72.

22 Q And you said it's a long line. I guess I'm just  
23 trying to figure out if it's at the very end of  
24 the line or if the line you have depicted on  
25 Figure 1 accounts for some uncertainty that the

1 efficiency gap might actually be to the right of  
2 whatever the number was calculated for 2012?

3 A Okay. So the uncertainty in that average, that  
4 95 percent confidence interval that's been drawn  
5 around the average, reflects the uncertainty in  
6 the estimate for 2012 and 2014. So to the extent  
7 we're uncertain about those point estimates, that  
8 uncertainty is reflected and that's what's  
9 generating the confidence interval that you see  
10 graphed for the average.

11 Q And this graph represents the average efficiency  
12 gap scores it says for 206 districting plans; is  
13 that correct?

14 A Uh-huh, that's correct.

15 Q Is that all of the districting plans you looked  
16 at?

17 A Yes.

18 Q And so I take it that Wisconsin obviously only has  
19 two elections under its plan, but some of these  
20 elections that are here have a full five elections  
21 under the plan?

22 A That's correct.

23 Q Okay. I guess we can move to 4.1, the Seats-Votes  
24 Curves. We had been talking about this a little  
25 bit before I believe, perhaps we can get into it a

1 little more here.

2 A Uh-huh.

3 Q I note that there's like a Footnote 1 that talks  
4 about the Cube Law. Can you just explain what the  
5 Cube Law is?

6 A Sure. The Cube Law really isn't a law. It's a  
7 law in the sense that social scientists sometimes  
8 use that term when talking about what might be  
9 better described as an apparent empirical  
10 regularity.

11 The Cube Law dates back to the very beginning  
12 of systematic study of electoral systems when turn  
13 of the 20th Century British statisticians started  
14 looking at the relationship between vote shares  
15 and seat shares in single-member district systems  
16 in the UK House of Commons in particular. And  
17 what was observed was a nonlinear relationship  
18 between vote shares and seat shares for a given  
19 party. And literally through fitting what might  
20 be the right curve to fit to that nonlinear  
21 relationship, it was speculated that that  
22 particular equation shown in Figure 1 would  
23 produce a good fit to the data that that group of  
24 early investigators of this topic were seeing in  
25 the UK House of Commons data.

1           And if I were to describe it to you, you get  
2           an S-shaped curve of the sort that I've graphed in  
3           Figure 2 on Page 10, and that appeared to fit  
4           those early data reasonably well. And it was  
5           speculated that maybe there was something about  
6           the nature of single-member district systems that  
7           would produce S-shaped curves and indeed maybe  
8           S-shaped curves where the right power function  
9           there is cubic; hence, the Cube Rule or the Cube  
10          Law. But over time as we've investigated many,  
11          many single-member district systems over the  
12          years, we've come to realize that sometimes we see  
13          values higher than three and sometimes we see  
14          values lower than three.

15          Proportional representation is a special  
16          case. It's not a district system at all, right,  
17          it's just allocated seats in proportion to vote  
18          shares. That gives you a 45-degree line. It's  
19          essentially taking the three you see there in the  
20          Cube Law and setting up to one. And then there  
21          are even more extreme versions. You know,  
22          districting plans that are extremely protective of  
23          incumbents, actually the value drops below one.  
24          And you get sort of an inverted S-shaped curve, a  
25          curve that is steep at the ends but largely flat

1 over vote shares between say 25 to 75 percent, or  
2 if not quite flat then close to it.

3 And so the Cube Law lives on in the  
4 literature. It's a nice way to introduce people  
5 to the topic. And it still does express -- I  
6 think the thing to take away from it is that in  
7 single-member district systems you don't get  
8 45-degree lines, you get a quite abrupt  
9 nonlinearity. Single-member district systems hand  
10 out harsh punishment to parties whose vote share  
11 falls into the teens or the twenties or the  
12 thirties. Seat shares tend to rapidly improve as  
13 your vote share moves up towards into the forties,  
14 fifties and then tends to plateau out once  
15 statewide, jurisdiction-wide vote shares get  
16 largely beyond 70, 80 percent. And that's a  
17 regularity that holds up, and the Cube Law lives  
18 on in the sense that it was one of the first  
19 attempts to formalize that empirical regularity.

20 MR. EARLE: Before you ask the next  
21 question, just for the record I think there  
22 was a misspeak at the beginning of that  
23 answer where you referred to Figure 1 as  
24 opposed to Footnote 1 as to the location of  
25 the formula.

1 THE WITNESS: Oh, pardon me.

2 Footnote 1, location of the formula, yes.

3 Q And then just digging into that answer a little  
4 bit, you mentioned that sometimes instead of a  
5 cube you get a three, you get something higher or  
6 lower. If you go higher, does that make the shape  
7 of the curve steeper?

8 A Exactly.

9 Q And lower is flatter?

10 A Flatter, exactly.

11 Q You mentioned that this Cube Law differs from  
12 system to system, some systems have higher or  
13 lower. Is there a study about like what the  
14 proportion is in United States state legislature  
15 elections?

16 A Yes, indeed. So just keep in mind it's not the  
17 Cube Law that varies; it's the Cube Law proposes  
18 three, that's where you empirically go about  
19 trying to estimate these curves. Jurisdiction to  
20 jurisdiction or context to context, we see  
21 variation in the number that belongs there. And  
22 there's a large literature, you know, offering  
23 ways of estimating that number in state  
24 legislative elections comparing state legislative  
25 elections to house elections to an institution

1       like the electoral college winner take all by  
2       state with the exception of Maine and Nebraska.

3       So yeah, there are estimates like that out there.

4   Q   Does your calculation of the efficiency gap rely  
5       on a seats-votes curve?

6   A   Strictly speaking, no, no, although a seats-votes  
7       curve is implied by the efficiency gap.  If you  
8       assume the efficiency gap is zero, an underlying  
9       seats-votes curve is implied.

10  Q   What is the underlying seats-votes curve implied  
11       that you're mentioning?

12  A   Okay.  Figure 4 of Page 18 of my report, I show in  
13       orange the seats-votes curve that's implied by an  
14       efficiency gap of zero.  And it's what we would  
15       call formally a piecewise linear function that is  
16       flat, horizontal when vote shares lie between zero  
17       and .25, has a slope of two between vote shares of  
18       25 percent and 75 percent, and is again flat or  
19       horizontal from the point at which vote share is  
20       75 percent through to 100 percent.

21  Q   Okay.  So if I look at the orange line here on  
22       Figure 4 and if a seats-votes result in a  
23       particular election lies on that line, there'd be  
24       a zero efficiency gap?

25  A   Subject to some assumptions here, right, that that



1 would be subject to the equal votes in each  
2 district assumption, sure.

3 Q Okay. And then just to make sure I'm visualizing  
4 this correctly, is the vote share going to the  
5 right, that's the democratic vote share?

6 A It could be, it need not be. We're in a two-party  
7 system here is what all of this presumes, and  
8 those curves are perfectly symmetric, about 50/50.  
9 So it's just a point of convenience what you  
10 choose. But for sake of argument and the way I've  
11 done the analysis, I took it to be democratic vote  
12 share.

13 Q That's what I was going to ask. The way you did  
14 the analysis, was that the democratic votes -- V  
15 is democratic vote share?

16 A That's right.

17 Q And so if I wanted to plot out, you know, the  
18 democratic vote at 60 percent, I'd have to go  
19 to .6 on your map?

20 A That's right.

21 Q And just for example, if democrats had 60 percent  
22 of the vote, so I'd go to the 0.6?

23 A Uh-huh.

24 Q But they got 50 percent of the seats, I'd go up  
25 to .5?

1 A Uh-huh.

2 Q And I guess if I compare that to where the line is  
3 there, the line says it should be at .7 percent of  
4 the seats but they're at .5, what's the efficiency  
5 gap under that condition?

6 A Right. It's --

7 MR. EARLE: I'm going to object to  
8 the form of the question only because you  
9 were diagramming on your copy of the exhibit  
10 with your finger, and that's not going to  
11 appear on the transcript.

12 Q Did you understand the question?

13 A I did.

14 Q Okay.

15 A I did. Well, there's a very simple formula. So  
16 the scenario you sketched is that they won  
17 50 percent of the seats with 60 percent of the  
18 vote. And so in such a case, the efficiency gap  
19 there would be negative .2.

20 Q Okay. And that's just the difference between  
21 where that orange line intersects with .6 and  
22 where the actual seats number is?

23 A Yeah, that's right. And that's the sense in which  
24 earlier I referred to the efficiency gap measure  
25 or as inducing excess seats, understanding what's

1 going on here, that conditional on winning 60  
2 percent of the votes under the zero efficiency gap  
3 standard, we'd expect 70. Under your scenario  
4 they won 50; that difference is a deficit relative  
5 to what we would expect under a zero efficiency  
6 gap.

7 Q Okay. And then like just to view a different side  
8 of the coin, if they got 40 percent of the vote  
9 but got 50 percent of the seats, what would the  
10 efficiency gap be in that circumstance?

11 A If they won 50 percent of the seats with  
12 40 percent of the vote, in that case the  
13 efficiency gap is -- that would be a positive .2.

14 Q And then if we were -- say we just flip this to  
15 look at it from the republican perspective, it  
16 would be just a mirror image. That would be --

17 A Yeah, one minus everything, right.

18 MR. EARLE: We're getting a little  
19 conversational here. One of the things about  
20 depositions is when you discuss something,  
21 you get conversational and you sometimes  
22 speak over each other a little bit. And  
23 there was a little bit of that there. So if  
24 you could try to keep the question separated  
25 from the answer, that would be great.

1 Q I think I understand that now, so I'm just going  
2 to go backwards in the report to Page 16, and  
3 there are some equations here.

4 A Uh-huh.

5 Q Could you just start with the first one there, it  
6 starts with EG.

7 A Uh-huh.

8 Q What does that equation represent?

9 A That's the definition of the efficiency gap as the  
10 difference of two wasted -- two numbers of wasted  
11 votes.

12 Q So is WB, that's the wasted votes for --

13 A For Party B, and WA are the wasted votes for  
14 Party A. And we've divided in both cases by the  
15 total number of in this case the jurisdictions,  
16 the number of jurisdictions in the -- actually I  
17 misspoke. In this particular formulation, these  
18 are proportions, these are not numbers, these are  
19 proportions.

20 Q Okay. So maybe just explain that then.

21 A Yeah, right. The constituent parts of WA and WB  
22 are these quantities S and V. V is a vote  
23 proportion, in particular a share of the two-party  
24 vote for Party A, I express those as proportion.

25 Q Okay. So some of these examples we've been using,

1 if Party A got 40 percent of the vote, is WA  
2 40 percent?

3 A No, that's their wasted vote.

4 Q Oh, okay.

5 A Not the statewide vote.

6 Q Okay, I see. So the next equation down is WA  
7 equals a bunch of things that I don't understand,  
8 so maybe you could just --

9 MR. EARLE: Just so the transcript  
10 is clear, you're now discussing the second  
11 formula --

12 MR. KEENAN: On Page 16.

13 MR. EARLE: -- from the top of  
14 Page 16, okay.

15 Q What does this equation for WA mean?

16 A Okay. So there's a summation operator there, so  
17 over all districts we do the following: The vote  
18 share one -- okay, so these shares are defined  
19 with respect to Party A. So VI is the vote share  
20 of Party A in District I, and we're assuming it's  
21 a two-party system. So if VI exceeds .5, then  
22 Party A wins the district.

23 Q Right.

24 A So the wasted votes for Party A are in seats where  
25 it won the proportion of votes in excess of what

1       it needed to win, so that's why we've got VI  
2       minus .5, all right, multiplied by SI. Now, SI  
3       takes the value one when the party wins the seat  
4       and takes the value zero when it doesn't. So when  
5       SI is one, we're talking about seats that Party A  
6       won.

7               And then the second piece of the second  
8       equation on Page 16, one minus SI, well, if SI is  
9       one, then one minus SI is only one when SI equals  
10      zero. And so now that part of the equation is  
11      picking up wasted votes and seats that Party A did  
12      not win, and in that case the VI in that case  
13      they're all below .5. And the definition of  
14      wasted votes is any votes you cast that are cast  
15      for a party in seats that it goes on to lose are  
16      wasted votes.

17              So we've essentially summed up all the  
18      districts now, right. Every district is won by  
19      either Party A or Party B. Wasted votes in the  
20      seats that Party A wins are the vote shares in  
21      excess of .5. And in the seats that Party A loses  
22      it's just the vote share, so it's just VI in those  
23      cases. And then we're just summing now of all  
24      districts. So every district is appearing  
25      somewhere in that equation, either a seat that

1 Party A won or a seat that Party A did not win.

2 Q Okay. So this is a calculation to determine the  
3 wasted votes in a particular district; is that  
4 correct?

5 A But summed over all districts.

6 Q Yeah, I'm sorry. WA is the wasted votes in a  
7 particular district --

8 A No, no, for the whole jurisdiction.

9 MR. EARLE: Hold on, we're getting  
10 conversational again. Why don't we start  
11 over with the next question and rephrase it.

12 MR. KEENAN: Okay.

13 Q So the sum means that you do this sigma, is that  
14 the correct --

15 A Correct, yes.

16 Q You do that calculation for each and every  
17 district; is that correct?

18 A Subscript I indexes districts, so the summation  
19 over I takes us across districts. So now we've  
20 got a jurisdiction-wide quantity; WA is  
21 jurisdiction wide or in this case statewide as is  
22 EG, the efficiency gap itself.

23 What's happening down at the district level  
24 are these vote shares, VI and SI which is just  
25 telling us where the VI is above .5, and not

1           telling us who won the district.

2       Q    All right.  And as I understand it, you did not  
3           actually perform this particular calculation in  
4           every district across every election that you  
5           looked at?

6       A    Actually I used a very similar form of this after  
7           I was able to -- my version of the efficiency gap  
8           calculation, my calculations are extremely similar  
9           to this in that I substitute -- I have a vote  
10          share for each and every district.  So I did come  
11          up with a VI for every district.

12      Q    Okay.  So maybe I should just ask you how you  
13          calculated the efficiency gap for a particular  
14          state in a particular year.

15      A    Okay, sure.  Well, why don't we take an easy case  
16          where every district is contested and so VI is  
17          observed for every district.  And we're limiting  
18          ourselves or ignoring minor party candidates;  
19          we're focused on two-party competition.  In that  
20          case, the efficiency gap calculations are  
21          identical under either the form given in the top  
22          half of Page 16 as we've just been discussing and  
23          unpacking the three equations in the top half of  
24          that page, or we could use the formulation given  
25          in Equation 1 on the lower half of Page 16 where



1 we can rely quite simply on the statewide  
2 aggregate numbers  $S$  -- the seat share for Party A  
3 in this case the way I set it up, the democrats --  
4 and  $V$ , the average of the district vote shares.

5 Q So did you, in calculating the efficiency gap for  
6 all the various states that you looked at, did you  
7 use the equation here in 6.1 or the one above it  
8 in 6.0?

9 A Well, under the assumption of equal size  
10 districts, there's a strict correspondence between  
11 the two and so I assumed that. And so the  
12 distinction between the two forms is immaterial.

13 Q Yeah, and that may be. I'm just trying to figure  
14 out, though, like when you actually did the  
15 calculation, did you use the 6.1 equation or the  
16 one above it?

17 A Okay. To be perfectly clear, I used the equation  
18 labeled 1 on the bottom half of Page 16 but note  
19 that it has an input, to wit,  $V$ , which has these  
20  $V_i$ ,  $V$  subscript  $i$ , quantities which are analogous  
21 to the  $V_i$  quantities on the top half of the --

22 MR. EARLE: Just so the transcript  
23 is clear, you're referencing the sentence  
24 immediately below Formula 1 in 6.1 where  $V$   
25 equals, and then you have a formula.

1 THE WITNESS: That's right.

2 MR. EARLE: Okay.

3 Q And you mentioned -- it says there's an assumption  
4 of equally-sized districts.

5 A Yes.

6 Q Other parts of the deposition you talked about  
7 we've assumed equal number of voters. Is this  
8 equal number of voters or is it a different  
9 assumption?

10 A No, equal number of voters.

11 Q Okay. Because the districts could be equally  
12 sized and have different numbers of voters.

13 A I understand.

14 MR. EARLE: You want to take a  
15 break now?

16 MR. KEENAN: Yeah, we can take a  
17 break.

18 (Recess)

19 Q We're back on the record. You were in the middle  
20 of explaining how you calculated the efficiency  
21 gap, and I think we're on Page 16 of your report.

22 A Sure.

23 Q Going back to something you had said, you  
24 mentioned that you were looking at the two-party  
25 vote. Just so I understand that correctly, in a

1 race where there happened to be a third party  
2 candidate perhaps even only getting two percent of  
3 the vote or some small amount, what did you do  
4 with that party candidate's vote?

5 MR. EARLE: I'm going to object to  
6 the form of the question. Go ahead and  
7 answer if you understand the question.

8 A In such a case, everything I did is defined by  
9 computing the democrats' share of the two-party  
10 vote. So it would be D over D plus R and putting  
11 votes for any other candidates out of the  
12 analysis.

13 Q Okay. And then looking at the bottom of Page 16  
14 it says, "I operationalize V as the average over  
15 districts of the democratic share of the two-party  
16 vote, in seats won by either a democratic or  
17 republican candidate."

18 What did you do with a seat that wasn't won  
19 by a democratic or a republican candidate?

20 A And again, they're out of the analysis.

21 Q So, for example, if in Wisconsin there's 99 seats  
22 and one of them is won by some other party, then  
23 the analysis proceeds just looking at the 98 other  
24 seats?

25 A That's correct.

1 Q What does the average over districts of democratic  
2 share of the two-party vote mean?

3 A It means that you compute the democratic share of  
4 the two-party vote in every district, you sum that  
5 up over districts, and you divide by the number of  
6 districts.

7 Q So that will give you a number, a percentage?

8 A Yeah.

9 Q And then you say, "If districts are of equal size  
10 and ignoring seats won by independents and minor  
11 party candidates, then this average over districts  
12 will correspond to the democratic share of the  
13 statewide, two-party vote."

14 Okay. I think I understand that, so I don't  
15 need to ask more about it.

16 MR. EARLE: So there's no question?

17 MR. KEENAN: No.

18 MR. EARLE: All right.

19 Q We already went over the seats-votes curve, so I  
20 guess we can pass over that.

21 A Uh-huh.

22 Q Why don't you explain the set of legislative  
23 elections that you analyzed for your report?

24 A Sure. So the data -- well, the set of state  
25 elections I rely on span 1972 to 2014. I looked

1 at general election contests for State Lower House  
2 elections held under single-member district  
3 electoral systems. Or there are also a small  
4 number of districts and races in there that are  
5 multimember districts, but multimember districts  
6 with slots or positions. So we're able to  
7 identify which candidates were running for which  
8 slot and in effect treat them as if they were the  
9 functional equivalent of single-member districts.

10 Q Okay. So you only looked at elections that were  
11 the State Lower House; that's correct?

12 A That's correct.

13 Q So the Wisconsin State Senate, for example, that  
14 wasn't considered?

15 A Not in this analysis.

16 Q And then if there was any elections that had  
17 multimember, any multimember districts?

18 A There are some multimember districts in the  
19 analysis, but as I said earlier in answer to the  
20 previous question, only of a particular type.

21 MR. EARLE: Pause a little bit  
22 before answering the question so I can insert  
23 an objection if necessary. And I will, post  
24 hoc, make an objection to the form of that  
25 last question.

1 Q So just so I understand, if there was like a State  
2 Lower House that had most of its seats were  
3 single-member but there was a few that were  
4 multimember but not of this slotted type, then  
5 that election was not considered?

6 A There are a couple of cases in the data where I  
7 did keep elections of that type. There aren't  
8 many, but I put the multimember districts to one  
9 side that were not of that slotted position type.

10 Q But you could still run an efficiency gap on the  
11 remaining --

12 A That's right, yeah.

13 Q If you look at Figure 5 on Page 21, I just want to  
14 make sure that I'm understanding correctly that if  
15 there's an orange dot for the state in a  
16 particular year, that's an election that you did  
17 consider in your analysis?

18 A That's correct.

19 Q And if there's not a dot, then that election was  
20 not considered?

21 A Or there was not an election in that year, that's  
22 right.

23 Q Fair enough. Who is Karl Klarner?

24 A He's a political scientist.

25 Q And what role did he have in the data that you

1 used in your study?

2 A He is the current steward of this large canonical,  
3 in political science at least, canonical  
4 collection of data on state legislative election  
5 returns. And he supplied me with the data for up  
6 through 2014 which was the current append to the  
7 longer historical data collection that runs 1967  
8 to 2012.

9 Q Was Mr. Klarner the only source of your election  
10 data or did you go to some other sources as well?

11 A On the state legislative election returns, the  
12 collection that he is currently the steward of and  
13 the append for 2014 he gave me, that's where that  
14 data came from. There are of course other data  
15 used in the analysis that came from other sources.  
16 But in terms of the state legislative election  
17 outcomes, that data collection is the only source  
18 for those data.

19 Q Okay. So I see here 786 elections across 41  
20 states.

21 A Could you tell me --

22 Q Page 20 at the very bottom.

23 MR. EARLE: It's the last sentence  
24 on Page 20.

25 A Correct.

1 Q And then are all those 786 elections reflected on  
2 Figure 5?

3 A Yes.

4 Q Moving to 7.2, the uncontested races, you  
5 mentioned this a little bit before but why don't  
6 you explain how you accounted for uncontested  
7 races in your analysis?

8 A Okay. So in the what is an uncontested race, it's  
9 where we do not have a democrat facing off against  
10 a republican, and so we don't have votes from both  
11 a democrat and republican. In such a case, in  
12 order to come up with a vote share for that  
13 district, I relied on a modeling procedure that  
14 used presidential vote tabulated by state  
15 legislative district from the most temporally  
16 proximate presidential election. And I also took  
17 into account if the candidate who did -- the only  
18 candidate who did show up and was returned  
19 unopposed was an incumbent or not and of which  
20 party. So was it a republican incumbent, was it a  
21 democratic incumbent or was there no incumbent.

22 Now, what I did was to run regression  
23 analysis of the relationship between vote shares  
24 and the state legislative elections against  
25 presidential vote in districts where we did have a



1           contested race, so we get to observe both of these  
2           things in those cases. Then on the basis of what  
3           that analysis tells us about the relationship  
4           between those two variables taking into account  
5           incumbency, we're able then to make a prediction  
6           as to the vote share in an uncontested race  
7           because even in the uncontested races, races that  
8           aren't contested in the state legislative  
9           election, nonetheless we do have presidential vote  
10          share available in that district. And so the  
11          regression procedure is able to produce a  
12          prediction for those cases.

13        Q    Okay. Let's just get into some specifics there.  
14            So you said the presidential vote in the most  
15            recent or proximate presidential election.

16        A    Typically the preceding one.

17        Q    Preceding one. For example 2014, would you have  
18            looked at the 2012 presidential election?

19        A    Exactly, yes.

20                           MR. EARLE: Slipping into  
21                           conversation again, but --

22                           THE WITNESS: Sure.

23                           MR. EARLE: -- that's fine.

24        Q    And then for the 2012 election where there was a  
25            presidential election that year, would you have

1 just used the 2012 presidential election?

2 A Yes.

3 Q Okay. And then the regression analysis, was that  
4 done -- I guess against which unit is that done?  
5 Was that done for each state in each election or  
6 is it a nationwide thing?

7 A No. That regression analysis is run in each  
8 election -- each state, each election.

9 Q So there's a separate calculation for Wisconsin  
10 2012 from Michigan 2012?

11 A Yeah. And moreover, there's a separate  
12 calculation for Wisconsin 2012 republican  
13 incumbents versus Wisconsin 2012 democratic  
14 incumbents versus Wisconsin 2012 open seats.

15 Q So when you say an incumbent, does that refer to  
16 the candidate that's running unopposed whether  
17 they're an incumbent or not?

18 A That's right.

19 Q Okay. So you're trying to or what you're trying  
20 to do is model the share of votes that incumbent  
21 running would have received if there was an actual  
22 opponent?

23 A If in fact they had attracted a challenger, that's  
24 right.

25 Q Okay. And you're running a separate calculation

1 if the unopposed candidate is not actually an  
2 incumbent?

3 A The same type of calculation but leveraging off a  
4 different set of data.

5 Q Is the vote total that you're trying to find, is  
6 it just a percentage or is it an actual like  
7 number of votes?

8 A It's actually -- I'm trying to model a percentage,  
9 not a count.

10 Q So in the report on Page 26 through 29, it  
11 mentions two different imputation models?

12 A Right.

13 Q What are the two different imputation models?

14 A For prior to the 2000s, we don't have presidential  
15 vote share tabulated at the level of state  
16 legislative districts or at least that's not  
17 widely available. So there I relied on a  
18 different procedure, one that attempted to build  
19 an over time sequence. So inside a districting  
20 plan if we take a given district, suppose it was  
21 contested in one year and then it was uncontested  
22 in the following year but contested in the year  
23 after, in the election after that, then we had a  
24 basis for interpolating what the missing vote  
25 share would have been. Again taking into account

1       incumbency and also statewide factors, you could  
2       say it was a particularly good year or not so good  
3       year for the party in that state in that year. So  
4       that was the procedure I relied on in that case.

5             I engaged in some comparisons of how that  
6       method performed against the method I was able to  
7       use and I prefer to use for the period 2000  
8       forward where presidential vote shares were  
9       available and was reasonably satisfied that I was  
10      getting similar results. And although while I  
11      would much prefer to rely on presidential vote  
12      when I've got it as a basis for imputation, I was  
13      reasonably satisfied with the performance of that  
14      ultimate procedure based on the time periods where  
15      I had both methods so I could perform both  
16      methods. So I did a check of the performance of  
17      the two methods.

18    Q    Under the imputation model that didn't have  
19        presidential vote share available, how were you  
20        able to determine the share of votes when a  
21        district was always uncontested?

22    A    Right. That poses a real challenge. And at that  
23        point you're only able to rely on the identity of  
24        the incumbent and your estimate of the statewide  
25        vote share. And so in those cases, the estimates

1 of vote shares in such a district are relatively  
2 imprecise.

3 Q Okay. So if I understand, 8.1, Imputation model  
4 deals with the 2000 through the post 2000s that we  
5 have presidential vote share data?

6 A Well, you're actually also able to do a lot of the  
7 nineties as well because the 2000 presidential  
8 election takes place with the same districting  
9 plan in place for a lot of the elections of the  
10 nineties in a lot of jurisdictions.

11 Q Okay. So you actually used the 2000 presidential  
12 election and went backwards so to speak to impute  
13 election results into the nineties?

14 A Yeah.

15 Q Okay.

16 A Only in cases where the same plan's in place  
17 obviously.

18 Q Understood. I guess now we'll get in to your  
19 actual calculations of the efficiency gap by the  
20 state in each election.

21 A Sure.

22 MR. EARLE: Which page do we move  
23 to?

24 MR. KEENAN: 32.

25 Q Did you use some sort of computer program to run

1 the -- or programs to run the calculations?

2 A Yes.

3 Q And can you just explain what you did to get the  
4 efficiency gaps in terms of, you know, running  
5 through computer programs?

6 MR. EARLE: I'm going to object to  
7 the form of that question.

8 MR. KEENAN: Sure.

9 MR. EARLE: Do you understand the  
10 question?

11 THE WITNESS: No.

12 A I need you to be a bit more specific for me.

13 Q I understand that obviously you have a lot of data  
14 and I know that there's like -- I've seen some  
15 document production of a program called R?

16 A Uh-huh.

17 Q Could you explain how you used R in calculating  
18 the efficiency gap? On a general level; I don't  
19 need you to get into the --

20 A Okay. R is a widely used statistical data  
21 processing program used widely in the social and  
22 -- in science and in industry. I wrote programs  
23 in R that took the original data from the, as we  
24 were discussing earlier, the Karl Klarner  
25 collection. There's a lot of preprocessing

1 getting the data down to one record per district  
2 per election per state. Then at the level of each  
3 election, we then compute those quantities that go  
4 into the computation of the efficiency gap. So  
5 referring to my report, and I think we were  
6 discussing those equations earlier.

7 MS. GREENWOOD: Page 16.

8 THE WITNESS: Thank you.

9 A So for instance, Equation 1 on Page 16 then is  
10 computed for every election in this data set. And  
11 so in this instance, this analysis, 786 separate  
12 calculations of Equation 1. And again a program  
13 like R, this is rather straightforward, looping  
14 over the states and the years and keeping states  
15 grouped, you know, according to tagging them with  
16 a redistricting plan. That's precisely the sort  
17 of task that a computing environment like R is  
18 extremely well suited for, along with producing  
19 the graphs that appear throughout the report.

20 Q Yeah. And there are a lot of graphs, and I was  
21 just wondering if there was a -- do you have a  
22 master list anywhere, or perhaps it could be  
23 generated, that lists the efficiency gap as  
24 calculated by you for each state and each election  
25 that you analyzed?

1 MR. EARLE: Okay, that's a request.

2 MR. KEENAN: Well, I was just  
3 wondering if -- it doesn't exist in the  
4 documents.

5 MR. EARLE: Well, let's break it  
6 down into two things. You have a request and  
7 you have a question.

8 MR. KEENAN: Yeah.

9 MR. EARLE: Do the question first  
10 and then we'll respond to the request.

11 MR. KEENAN: Sure.

12 Q Have you generated such a report, a spreadsheet or  
13 something that contains that information?

14 A Yes.

15 Q And was it provided to your attorneys do you know?

16 A Yes.

17 Q Okay. So it should be in the data set that has  
18 been provided to me?

19 MS. GREENWOOD: We can talk about  
20 that. I don't think it's in the data set  
21 provided to you.

22 MR. KEENAN: Okay.

23 MS. GREENWOOD: Because of what was  
24 -- we can take about that.

25 MR. KEENAN: Okay. I think I would



1           like to have something like that, just like a  
2           spreadsheet or something.

3                   MR. EARLE:   Okay.   So you want a  
4           copy -- to the extent that it exists, you  
5           want a copy of the spreadsheet that includes  
6           the analysis from 1972 for the entire, all  
7           786 --

8                   MS. GREENWOOD:   The efficiency gap.

9                   MR. EARLE:   All 786 efficiency gap?

10                   MR. KEENAN:   Yeah.   I mean, there  
11           are data points on various graphs and things,  
12           but you don't actually know what the specific  
13           number is and like which state is this one  
14           and things like that.

15                   MR. EARLE:   We'll get back to you  
16           on that.

17                   MS. GREENWOOD:   Yeah.

18                   MR. KEENAN:   All right.

19   Q   Looking at Figure 11 on Page 33, what does the  
20       orange line represent?

21   A   That is the seats-votes curve corresponding to an  
22       efficiency gap of zero.

23   Q   Okay.   And then if we see a -- it looks like  
24       they're represented by boxes?

25   A   Uh-huh.

1 Q What does each little box represent?

2 A A plotted square is the particular vote share and  
3 seat share, all right -- so a vote share on the  
4 horizontal axis, seat share on the vertical axis  
5 -- from each of the 786 elections in the analysis.

6 Q And then elections that are I guess I want to say  
7 above and to the left of the orange line, would  
8 those be positive or negative efficiency gaps?

9 A Right. The vertical distance of a plotted square,  
10 if you project up or down to the orange line,  
11 gives you the efficiency gap. And so a data point  
12 that lies vertically above the orange line  
13 indicates a positive efficiency gap and a data  
14 point that lies below in a vertical distance, and  
15 vertical distance vertically below the orange  
16 line, indicates a negative estimate of the  
17 efficiency gap -- would correspond to a negative  
18 estimate of the efficiency gap.

19 Q Just turning to the next page, Figure 12, looking  
20 at that, can you explain what Figure 12  
21 represents?

22 A Figure 12 represents the individual  
23 election-by-election efficiency gap estimates  
24 ordered by time left to right, and with the box  
25 indicating the point estimate of each efficiency

1 gap and the vertical bars extending outward from  
2 each box indicating length of a 95 percent  
3 confidence interval around each  
4 election-by-election estimate. And the data of  
5 course are grouped by state and ordered by time.

6 Q Is there a reason Vermont is listed at the top  
7 left?

8 MR. EARLE: Were you finished with  
9 your question?

10 MR. KEENAN: Yes.

11 MR. EARLE: Okay.

12 A That's a peculiarity of R. If you look, it's a  
13 reverse alphabetical order going from bottom left  
14 through to the top right.

15 Q Okay.

16 A That's all that is.

17 Q It confused me so --

18 A Yeah.

19 Q I was just going to go through the -- on the next  
20 page on 35 there's numbers with some points here.

21 A Uh-huh.

22 MR. EARLE: When you say numbers,  
23 you mean numbered paragraphs?

24 MR. KEENAN: Yeah, numbered  
25 paragraphs.

1 MR. EARLE: Okay.

2 Q So in Paragraph 4, is it true that New York had  
3 the lowest median efficiency gap estimates in your  
4 study?

5 A Yes.

6 Q And what is -- maybe just explain what a median  
7 estimate gap is.

8 A The plural in estimates there may be misleading.  
9 The lowest median -- if you took the median of all  
10 of New York's efficiency gap estimates, right, and  
11 then you did that for each state, New York has the  
12 lowest of those medians across the states. That's  
13 what I'm trying to say in the opening of  
14 Paragraph 4 on Page 35.

15 Q Okay, that makes sense. And for a low efficiency  
16 gap, that means favorable to republicans and  
17 unfavorable to democrats?

18 A That's right.

19 Q And No. 5 says Arkansas has the highest median  
20 efficiency gap score?

21 A That's right.

22 Q So that would be the highest median that's  
23 favorable to democrats?

24 A That's right.

25 Q And I believe you found Michigan was the third

1 lowest median efficiency gap score by state. Is  
2 there a list in here of each state's median?

3 A Not that I'm aware of.

4 Q Okay. No. 8 on the next page deals with Wisconsin  
5 specifically. It says Wisconsin's EG estimates  
6 range from negative .14 to .02. So is .02 the  
7 most favorable efficiency gap to democrats that  
8 you observed in Wisconsin?

9 A Yes.

10 Q Okay. And when you say efficiency gap estimates,  
11 what do you mean by that?

12 A Okay. I used the language of estimate; the word  
13 "estimate" appears because of the modeling that  
14 went into handling uncontested seats. And that's  
15 just the way I think any social scientist would  
16 refer to a calculation that came out of a  
17 procedure like that. In three cases we could drop  
18 the word estimate, in three cases where every seat  
19 was contested, but there are only three out of  
20 786. So for the rest of the time, I prefer the  
21 word estimate.

22 Q And are those three elections that are not  
23 estimates, is that because they had no uncontested  
24 seats at all?

25 A That's right. And hence nothing had to be done,

1       yeah, for the uncontested seats.

2       Q    Is the level of confidence in a particular  
3       efficiency gap estimate -- sorry, I'll start over  
4       again. Does the level of confidence in a  
5       particular efficiency gap estimate change from  
6       election to election and state to state?

7       A    Yes.

8       Q    And what factors affect that?

9       A    The proportion of seats that are uncontested.

10      Q    Okay. And I would take it that a lower proportion  
11      of uncontested seats would give you more  
12      confidence in your calculation?

13      A    And the limiting case is of course zero  
14      uncontested seats in which case the confidence  
15      interval around an estimate collapses onto a point  
16      estimate itself. And in such a case, we could  
17      dispense with the word estimate.

18      Q    And you looked at Wisconsin's election results for  
19      every year from 1972 to 2014?

20      A    That's correct.

21      Q    And among that whole time, the most favorable  
22      efficiency gap to democrats was .02; is that  
23      correct?

24      A    That's correct.

25      Q    And you found that Wisconsin has recorded an

1 unbroken run of negative EG estimates from 1998 to  
2 2014; is that correct?

3 A That's correct.

4 Q Looking at Figure 13 on Page 37, there's a series  
5 of plotted squares -- is that the correct term?

6 A That will work.

7 Q -- that are connected by a line. I was just, my  
8 question was whether that line -- does that line  
9 move temporally from, for example, 1972 to 1974 or  
10 is it just the nearest dot?

11 A No. It's difficult to see in this case but what I  
12 -- I was indeed trying to demonstrate the temporal  
13 sequence, and I used a solid box to indicate the  
14 end of the sequence so that's 2014. And you can  
15 kind of make out backward through time the way  
16 that sequence of efficiency gap estimates in  
17 Georgia in this case, in Figure 13 we're looking  
18 at Georgia, the evolution that the sequence of  
19 efficiency gap estimates can literally be read off  
20 that graph, you know, regard from being below the  
21 orange line in recent elections to earlier in time  
22 to be considerably above the orange line in an  
23 earlier phase in Georgia.

24 Q Okay. So I noticed that there's a similar type of  
25 graph, looks like every page, 37 through 42; do

1       you see that?

2       A     Indeed, yeah.

3       Q     For each of these, did you use the same procedure  
4           of having a solid box for the most recent election  
5           and then connecting the line to the --

6       A     Yeah, that's correct.

7       Q     Okay. So for each of these if I start at the  
8           solid box, then I go from there and work my way  
9           backwards through time?

10      A     Well, it can be difficult when the lines overlap,  
11           but absent that problem, that would be correct,  
12           yeah.

13      Q     And again looking at each of these plotted  
14           squares, the ones that are below on the vertical  
15           axis from the orange line are negative efficiency  
16           gaps?

17      A     That's correct.

18      Q     And the ones that are above are positive  
19           efficiency gaps?

20      A     That's correct.

21      Q     And then going to 42 is Figure 18, Wisconsin, so  
22           this shows graphical plot of all the efficiency  
23           gaps you calculated in Wisconsin from 1972 to  
24           2014?

25      A     Well, one can figure out what the efficiency gap



1 estimates are in the sense I was talking about  
2 earlier in that they're the vertical distance of  
3 each plotted square from the orange line with the  
4 last two, 2014, being the solid point there in the  
5 lower left quadrant of the graph. And you can see  
6 the line taking us back in time to the immediately  
7 preceding election in 2012.

8 Q Going on to Page 44 now, Section 9.2.

9 A Uh-huh.

10 Q It's titled Over-time change in the efficiency  
11 gap.

12 A Uh-huh.

13 Q What did you find with respect to any changes in  
14 the efficiency gap over time from the beginning of  
15 the 1972 period that you looked at till today?

16 A At a high level of generality, the general trend  
17 in the distribution of efficiency gap estimates  
18 across states is for a roughly -- we see plans  
19 more favorable to democrats, at least as measured  
20 by the efficiency gap, in the earlier decades of  
21 this analysis. But in the late nineties and  
22 particularly 2000s onwards, that shifts and on  
23 average, efficiency gap estimates from the mid  
24 nineties onwards on average are indicative of  
25 plans that are favoring republicans. So negative

1 efficiency gap estimates are tending to be the  
2 norm although there's considerable -- I think it's  
3 important to note that at any given time point,  
4 there's considerable spread in the distribution.  
5 So that's sort of a weak trend in the overall  
6 distribution.

7 Q Yeah, let's look at Figure 20 which I believe  
8 you're referring to.

9 A Uh-huh.

10 Q Could you explain what the -- to look at it, the  
11 bottom, I guess the horizontal axis has time,  
12 1970, 1980, 1990, 2000, 2010, vertical is the  
13 efficiency gap, and there's a series of black  
14 dots.

15 A Uh-huh.

16 Q What does each black dot represent?

17 A Each black dot is an efficiency gap estimate from  
18 a specific election. So they're grouped by the  
19 year of the election. Typically most of these  
20 states, the elections have been held in  
21 even-numbered years.

22 Q Okay. And then so if you look at any one  
23 particular year, the highest dot would be the plan  
24 that's the most -- or the election that's the most  
25 favorable to democrats as measured by the

1 efficiency gap?

2 A That's right. Positive values of the efficiency  
3 gap are indicative of plans favorable to  
4 democrats. And so as you go vertically up the  
5 graph, you're in positive territory up in the  
6 very, all right, above zero there in the top half  
7 of the graph. And for the contrary, for negative  
8 territory on the vertical axis, the bottom half of  
9 the graph, negative estimates of the efficiency  
10 gap indicative of plans that are not advantageous  
11 to democrats.

12 Q So the lower most dot would be the plan that's  
13 most favorable to republicans as measured by the  
14 efficiency gap?

15 A That's right.

16 Q And there's three blue lines on the graph; could  
17 you explain what those are?

18 A Yeah. That's estimating -- the middle blue line  
19 is an estimate of the median across states, all  
20 right. So in any given year, looking at that  
21 spread of points in the vertical dimension  
22 estimating where the median is but performing a  
23 little bit of what we call smoothing so to produce  
24 a trend over time in both. So the middle line is  
25 the smoothed over time estimate of the median

1 efficiency gap.

2 The upper blue line is a smooth estimate of  
3 the 75th percentile, the point at which only  
4 one-quarter of elections are producing efficiency  
5 gap estimates more extreme than that. And the  
6 lower blue line is the smooth estimate of the 25th  
7 percentile of the distribution of efficiency gap  
8 estimates, the point at which only 25 percent of  
9 elections are producing efficiency gap estimates  
10 more advantageous to republicans than where the  
11 blue line is, the lower blue line.

12 Q So looking at just like one election --

13 A Uh-huh.

14 Q -- you plotted each, or plotted might not be the  
15 best word, but plotted each efficiency gap that  
16 you calculated on that line, and then the median  
17 is the one that's in the middle when you line them  
18 up lowest to highest?

19 A Yeah. The median is the middle of the efficiency  
20 gap estimates arrayed from lower to high, and the  
21 only qualification is that we've smoothed --  
22 there's a little bit of smoothing going on.  
23 Otherwise the estimate of that median would be  
24 quite jagged if we did it with respect to every  
25 two years. So we employed a little statistical

1 technique called smoothing to just make that less  
2 jagged and easier to visualize than it would be  
3 otherwise.

4 MR. EARLE: And just for the record  
5 to make it clear, the deponent was using his  
6 hands to symbolize a sawtooth pattern as he  
7 was describing the word "jagged."

8 Q So if I'm reading this correctly, since about it  
9 looks like as you said the mid nineties, the  
10 median plan has been an efficiency gap that's  
11 favorable to republicans?

12 A That's right. Well, strictly speaking, the median  
13 efficiency gap estimate, right, so plans span  
14 multiple elections. But substantially the  
15 characterization that plans is correct, but  
16 technically the graph is displaying  
17 election-by-election estimates of the efficiency  
18 gap.

19 Q Yeah. So the median efficiency gap that you  
20 calculated for that particular election year?

21 A Election year, correct.

22 MR. EARLE: That's fine. The  
23 question wasn't complete, he was referencing  
24 the prior question. But that's okay, the  
25 transcript will reflect that.

1 Q Turning to Figure 21 on the next page, could you  
2 explain what Figure 21 represents?

3 A Right. So for each efficiency gap estimate, each  
4 one comes equipped with some uncertainty. And  
5 what I've attempted to do in Figure 21 is to take  
6 into account that uncertainty and produce,  
7 averaging over all efficiency gap estimates  
8 produced in a given year and taking into account  
9 the uncertainty that accompanies each one,  
10 nonetheless, what's the probability that a given  
11 efficiency gap number from a given election year  
12 is positive or negative, all right.

13 So here I've plotted the probability that an  
14 efficiency gap estimate from 1972 is positive, and  
15 remember positive means would favor democrats, and  
16 in 1972 we see that that's just above 50 percent.  
17 We see that cluster -- we see a bunch of estimates  
18 above 50 percent through to the mid nineties, and  
19 this largely tracks, you know, it's another  
20 summary of the distribution of the data presented  
21 in Figure 20, all right.

22 And so as the data in Figure 20 we saw the  
23 median fall below zero in the mid nineties.  
24 Likewise, this estimate of the probability that an  
25 efficiency gap estimate is positive, it falls

1 below .5 meaning it's more likely than not that  
2 efficiency gap estimates from that election year  
3 are negative. That happens in the mid nineties,  
4 and it's largely that way say for that line 50/50  
5 result in 2010 as indicated on Figure 21.

6 Q So is this, looking at like 2006 because it's  
7 almost precisely on that .25 percent line --

8 A Uh-huh.

9 Q -- does that mean that 25 percent of plans were  
10 efficiency gap positive and 75 percent of plans  
11 were efficiency gap negative that year?

12 A Of elections held under plans in that year,  
13 25 percent of the efficiency gap estimates  
14 produced in that election year indicated  
15 democratic advantage, 75 percent indicated  
16 republican advantage.

17 Q Okay. And going back to Figure 20, is each state  
18 weighted equally --

19 A Yes.

20 Q -- in these graphs?

21 A Yes.

22 Q And then I did note that on Figure 20 it said at  
23 the very end on the little caption it says,  
24 "weighted by the precision of each EG measure."  
25 What does that mean?

1 A Okay. So when the median is computed, an estimate  
2 of the efficiency gap that is imprecise  
3 contributes less weight to the computation of the  
4 estimate of where the median is than one that's  
5 estimated precisely, more precisely. So it is not  
6 the case that each state is weighted equally.  
7 They're precision weighted estimates of the median  
8 of the 25th percentile and of the 75th percentile.

9 Q Turning to Figure 22, what does this graph  
10 represent?

11 A This is in a sense folding the efficiency gap  
12 estimates now. So now we're looking at the  
13 absolute value in magnitude, not -- so we're just  
14 literally asking irrespective of the partisan  
15 advantage that may or may not indicate, just are  
16 the raw values in absolute value terms of a  
17 changing over time. And here the answer seems to  
18 be that's reasonably stable over time.

19 Q So when you say absolute value, what does that  
20 mean?

21 A It literally means a number that is negative, you  
22 would call a positive sign. The positive numbers  
23 stay the same. We're just literally looking at  
24 magnitudes now, not -- we're wiping out the sign,  
25 we're ignoring the sign of a given efficiency gap



1 estimate.

2 Q Okay. So a negative 10 and a positive 10 now  
3 become --

4 A Are treated the same, yeah, for the purposes of  
5 Figure 22.

6 Q Okay.

7 MR. EARLE: Yeah, we had a little  
8 overlap there. And maybe, Brian, you want to  
9 clear that up.

10 MR. KEENAN: Sure.

11 Q For the purposes of Figure 22, a negative 10 and a  
12 positive 10 would both be plotted out at the .10  
13 level?

14 A That's correct.

15 Q Going to 9.3 which is titled Within-plan variation  
16 in the efficiency gap.

17 MR. EARLE: So you're on Page 48?

18 MR. KEENAN: Yes, 48.

19 Q So you did note that within a particular plan the  
20 efficiency gap will change over the course of that  
21 plan; is that correct?

22 A That is correct.

23 Q And it's your opinion that some of this change is  
24 caused by districts displaying demographic drift  
25 which is gradually changing the political

1           complexion of those districts; is that correct?

2       A     That's one reason.

3       Q     And then another one would be incumbent losing or  
4           not running again for some reason; that's true?

5       A     That's true.

6       Q     And then you also found that a variation in  
7           turn-out most prominently from an on-year to an  
8           off-year election will cause the distribution of  
9           vote shares to vary from election to election; is  
10          that correct?

11      A     That's correct.

12      Q     And an on-year election, that's a presidential  
13          election, correct?

14      A     That's what I mean by that, yes.

15      Q     And then an off-year is an election that takes  
16          place in a year when there's not a presidential  
17          election?

18      A     Right.

19      Q     So, for example, in Wisconsin in 2012, that would  
20          be an on-year election?

21      A     That's correct.

22      Q     And then 2014 is an off-year election?

23      A     That's correct.

24      Q     Going down to the third paragraph it says, "About  
25          76 percent of the variation in the EG estimates is

1           between-plan variation." What does that mean?

2    A    Okay. So suppose you took all the efficiency gap  
3           estimates, 786 of them, and you want to assess the  
4           extent to which the efficiency gap is more or less  
5           stable over the life of a plan and hence would  
6           bolster up confidence that we're measuring a  
7           characteristic of the plan and not these  
8           election-to-election vagaries that you just led me  
9           through.

10                 What we observe is that 76 percent of the  
11           variation is due to if we clustered the efficiency  
12           gap estimates by what plan they belong to, if we  
13           group them by that, the variation across those  
14           groups now is 76 percent of the total variation we  
15           saw which means that 100 minus 76, 24 percent of  
16           the variation we see in efficiency gap estimates  
17           is within-plan variation. And so that means by a  
18           ratio of about three to one, all right, it's what  
19           plan I'm in is three times as important in telling  
20           me what level of efficiency gap I'm going to see  
21           than other factors such as these  
22           election-to-election vagaries.

23                 So this bolsters my confidence that the  
24           efficiency gap is measuring something about the  
25           plan and isn't varying so much election to

1 election that who knows what it's telling us about  
2 the plan. The strong clustering by plan in the  
3 efficiency gap scores is what that between-plan  
4 variation reference is getting at.

5 Q Did you do any analysis of analyzing, comparing  
6 the differences between just specific states  
7 between plans and whether a factor was just the  
8 underlying nature of the state?

9 MR. EARLE: I'm going to object to  
10 the form of that question but go ahead, you  
11 can answer.

12 A I didn't quite catch the last part of it.

13 Q Sure. Did you do any analysis of examining the  
14 difference in efficiency gap just looking at the  
15 variations in states over time through different  
16 plans and whether there was any correlation  
17 between the efficiency gap in just the particular  
18 state that was being measured?

19 MR. EARLE: I'm going to object to  
20 the form of the question as ambiguous. Are  
21 you referring to the variables that you went  
22 through before being the factors? I mean, I  
23 don't understand the question, I guess.

24 MR. KEENAN: No, he's talking about  
25 that he saw that variations in plans,

1           76 percent, you know, there's clustering by  
2           plan.

3   Q   Did you do any analysis of clustering by states  
4       around efficiency gap numbers through time?

5   A   Well, clustering by state, holding time, bundling  
6       all efficiency gap estimates by time, if that's  
7       what you mean, the answer is no, I haven't  
8       performed that specific analysis.

9                   MR. EARLE:  You completed your  
10                  answer?

11                   THE WITNESS:  Yes.

12                   MR. EARLE:  Okay.

13   Q   Going to Page 49, there's a second paragraph  
14       there, it says, "A plan with moderate variability  
15       in the EG.  The median, within-plan standard  
16       deviation of the EG is about .03."  What does that  
17       mean?

18   A   Okay.  So recall that we begin with an efficiency  
19       gap estimate for each election.  Elections are  
20       then bundled into plans.  And so for a given plan,  
21       we may have up to as many as five say estimates of  
22       the efficiency gap, all right.  So now we're up at  
23       the level of plans.

24                   For each plan, we can compute a measure of  
25       how variable the efficiency gap is over the life

1 of the plan. And the particular measure of  
2 variability I used is the standard deviation, the  
3 square root of the variance. And now I have one  
4 of those numbers for each plan, and I simply  
5 computed the median of those standard deviations  
6 across the 200 odd plans in this analysis.

7 Q Okay. And in thinking about just what that means  
8 for a particular plan specific efficiency gap  
9 calculation, what does that .03 mean? Does that  
10 mean that like the median plan would deviate  
11 between .03 and .06 or like .3 from the middle of  
12 the plan, the median efficiency gap calculated  
13 under that plan? I mean, I just ask you to help  
14 me understand.

15 A Sure, sure.

16 MR. EARLE: So the question is  
17 you're asking him to help you understand --

18 MR. KEENAN: Yeah, what this means.

19 MR. EARLE: -- the ambiguous  
20 question, which I was struggling with the  
21 same thing. But I just want to clear that  
22 up. Go ahead.

23 A See if I can clarify here a little. One way to  
24 think of it, let's suppose a plan has -- we don't  
25 have to suppose. A plan will have an average

1 efficiency gap number associated with it, right.  
2 And then the standard deviation measures variation  
3 in efficiency gap estimates over the life of the  
4 plan. And averaged over all plans, that  
5 variation, the median standard deviation is .03.

6 Now, how to interpret that. If, and it's an  
7 if, efficiency gap estimates followed say a normal  
8 distribution, then we could expect that it would  
9 be extremely unlikely to see an efficiency gap for  
10 a given election more than two standard deviations  
11 away from the average efficiency gap estimate for  
12 the plan. So that would be in this case plus or  
13 minus .06. That would be an extremely  
14 conservative bound on how much variation you see  
15 in efficiency gap estimates over the life of a  
16 plan around the average efficiency gap estimate we  
17 see over the plan.

18 Q Okay. So just in my head, like if the average  
19 efficiency gap is .05, one standard deviation away  
20 is .08?

21 A Uh-huh.

22 Q And then two would be .11?

23 A Yeah.

24 Q It would be unlikely to get -- statistically  
25 unlikely to get higher than .11?

1 A Yeah.

2 Q Okay. But then it could go the other way as  
3 well; .05 could go down to .02, correct, for one  
4 standard deviation?

5 A Well, two --

6 MR. EARLE: You're getting  
7 conversational again.

8 Q So if the average is .05, if the standard  
9 deviation goes the other way, one standard  
10 deviation is down to .02?

11 A Uh-huh.

12 Q Okay. And then two standard deviations away would  
13 be going to the other side of zero to --

14 A Yeah, negative .01.

15 Q Okay. Makes sense.

16 MR. EARLE: You said it makes  
17 sense?

18 MR. KEENAN: It makes sense to me  
19 now.

20 Q How did you go about measuring the durability of  
21 an efficiency gap over the course of a plan?

22 A I did a number of things. One of the first things  
23 I did was to compute just pair-wise election to  
24 election under a plan how often or the probability  
25 that a temporally adjacent pair of efficiency gap



1 estimates have the same sign. But the other thing  
2 I did was to also compute the probability that  
3 given the efficiency gap estimate we see at the  
4 start of a plan, the probability that the sequence  
5 of efficiency gap estimates we see from that point  
6 forward, right, the subsequent fall elections,  
7 have the same sign as the efficiency gap estimate  
8 that the plan opened with.

9 Q And then what did you find with respect to the  
10 chance that the plan would keep the same sign over  
11 the course of the plan?

12 A Well, so I'm referring to on Page 55 of my report.  
13 If we restrict our attention to efficiency gap  
14 measures available for three -- plans where we've  
15 got efficiency gap measures for three or more  
16 elections, the probability of seeing three or more  
17 efficiency gap estimates with the same sign, there  
18 are 141 such plans; 35 percent of those 141 plans  
19 had at least a 95 percent probability of each of  
20 the efficiency gap measures having the same sign.  
21 So I understand that's a little, may be a little  
22 difficult to parse, but --

23 MR. EARLE: You said parse?

24 THE WITNESS: Yes, P-A-R-S-E.

25 A So there's 141 -- I'll say it one more time.

1       There's 141 plans, all right, give us three or  
2       more elections with sequences of efficiency gaps  
3       of like three or more. What's the probability  
4       that they've all got the same sign? Well, 35  
5       percent of those 141 plans, that probability is  
6       about 95 percent. If you say 75 percent chance of  
7       having the same sign, then we go up to roughly  
8       about half, 46 percent of the plans have at least  
9       a 75 percent chance of retaining the same sign  
10      over the life of the plan.

11     Q   And then how do you -- how are you calculating  
12       this 95 percent probability and the 75 percent  
13       probability? I don't really understand that.

14     A   Remember that each estimate of the efficiency gap  
15       comes with a confidence interval, and so it's  
16       taking into account the fact that each efficiency  
17       gap is being estimated with some uncertainty. And  
18       so, you know, there's a chance given that  
19       uncertainty that in any given year, for instance,  
20       that confidence interval may drift above zero.  
21       And so we want to take that into account when we  
22       talk about the stability of the efficiency gap.  
23       So that's why this is being couched in  
24       probabilistic terms.

25               For any given plan with its sequence of

1 efficiency gap estimates, there's a probability  
2 that that sequence of efficiency gap estimates  
3 lies above or below zero, reflecting the  
4 uncertainty that each individual efficiency gap  
5 estimate is accompanied with.

6 Q Okay. So I think that leads then to you found  
7 17 plans that were utterly unambiguous as to their  
8 sign?

9 A That's right.

10 Q What does that mean?

11 A The individual efficiency gap estimates are so far  
12 from zero in a positive or negative direction and  
13 the uncertainty that accompanies each of those  
14 efficiency gap estimates is sufficiently small  
15 that the probability that we're seeing a sign flip  
16 is zero, out to as many decimal places as is  
17 reasonable.

18 Q No part of any confidence interval ends up on the  
19 other side of a line?

20 A It's even stronger than that. Remember those  
21 confidence intervals go up to 95 percent. Now  
22 we're up to 99.99999 percent. And that's an  
23 extremely stringent standard, and that's why it's  
24 a relatively small set of plans that it's not  
25 beyond -- you know, we're not just beyond the

1 typical standards used in the social sciences, say  
2 95 percent; we're essentially within rounding  
3 error of 100 percent.

4 Q And those 17 plans are listed in Table 1 on  
5 Page 55; is that correct?

6 A That's right.

7 Q And as I read it, 16 of those 17 plans were  
8 unambiguously negative efficiency gaps which means  
9 they were favorable to the republicans and  
10 unfavorable to the democrats?

11 A That's correct.

12 Q And then one of them which looks to be Florida --

13 A Uh-huh.

14 Q -- in 1972 to 1980 was favorable to the democrats  
15 and unfavorable to the republicans?

16 A That's right.

17 Q Did you do any analysis on these states as to like  
18 which party was in control of the districting for  
19 these unambiguous plans?

20 A No, I did not.

21 Q And Wisconsin here, 2002 to 2010, that shows up as  
22 an unambiguously negative plan, correct?

23 A That's correct.

24 Q Okay. And I see the average efficiency gap of  
25 Wisconsin from 2002 to 2010 was negative .076

1 percent?

2 A Well, negative .076.

3 Q Okay. And negative -- I'll ask it again.

4 A Or we could say negative .7 --

5 Q Negative 7.6 percent?

6 A If we wish, yes.

7 Q And then the efficiency gap minimum which I guess  
8 would be the plan, the calculation that was most  
9 favorable to republicans and least favorable to  
10 democrats was negative .118; is that correct?

11 A That's correct.

12 Q And then the efficiency gap max which would be the  
13 plan that was --

14 MR. EARLE: Hold on a second, I  
15 think he's looking at -- in response to the  
16 last question.

17 A Yep.

18 Q And then the efficiency gap max is the plan that  
19 is most favorable to democrats and least favorable  
20 to republicans, and that's negative .039?

21 A That's correct.

22 Q Okay.

23 MR. KEENAN: I think now is a good  
24 time for a break.

25 MS. GREENWOOD: Yeah, sure.

1 (Discussion off the record)

2 (Recess)

3 Q Professor Jackman, you understand you're still  
4 under oath?

5 A Yes.

6 Q All right. Let's turn to Page 56 of your report  
7 which is Section 10. Why don't you describe how  
8 you determined a threshold for determining if the  
9 EG is a large and enduring characteristic of a  
10 plan.

11 A Sure. In this part of the report, what I sought  
12 about finding was a particular threshold value of  
13 the efficiency gap such that if you saw a value of  
14 the efficiency gap that large or larger, there's a  
15 low probability that you would see an efficiency  
16 gap with the opposite sign elsewhere over the life  
17 of the plan.

18 Q Okay. And why did you base your test on seeing an  
19 election with the opposite sign over the course of  
20 the plan?

21 A Well, remember that the sign of the efficiency gap  
22 is indicative of passing advantage one way or the  
23 other. So if a plan were to produce a sequence of  
24 efficiency gap values all of the same sign, that's  
25 evidence that's more consistent with the

1 proposition the plan is advantaging one side or  
2 the other than if the efficiency gap estimates  
3 were to alternate sign or to be of mixed sign over  
4 the life of the plan. So consistency of sign of  
5 the efficiency gap estimate I took to be a signal,  
6 a reliable signal of the partisan advantage of the  
7 plan.

8 Q In this Page 56 it says EG with a little star  
9 after it. What does that refer to?

10 A That's the threshold or the putative, the proposed  
11 threshold, yeah.

12 Q Going down you say that, "Plans with at least one  
13 election with an efficiency gap greater than .07  
14 are reasonably common."

15 So you found that there was a 20 percent  
16 chance that a plan will have at least one election  
17 that has an efficiency gap that's greater  
18 than .07?

19 MR. EARLE: You're referring to the  
20 second to last paragraph of Section 10 on  
21 Page 56, correct?

22 MR. KEENAN: Yes.

23 MS. GREENWOOD: Maybe you should  
24 just explain when you have EG between --

25 THE WITNESS: Sure.

1 A On the page, on Page 56 in that second to last  
2 paragraph, EG appears with two vertical bars  
3 around it. That's a mathematical notation for  
4 absolute value. So irrespective of sign, just in  
5 terms of raw magnitude, seven percent positive or  
6 negative is reasonably common is the way to read  
7 that. And that again is taking into account the  
8 uncertainty that accompanies the efficiency gap  
9 estimates.

10 Q Okay. Looking at Figure 27, could you explain  
11 what's represented here?

12 A Sure. Okay. So there are two quantities plotted  
13 on Figure 27, and the color version of the report  
14 makes the two quantities clear. In blue is the  
15 proportion of plans that have an efficiency gap  
16 estimate in excess of where we are on the  
17 horizontal axis. So let's just take, for  
18 instance, to the immediate left of zero we have  
19 negative not much, negative a little bit. And  
20 there are lots of plans, right, that produce an  
21 efficiency gap in excess of that threshold; about  
22 75 percent of plans will do that.

23 But you'll note that as we move away from  
24 zero on the horizontal axis of the graph, as we  
25 move out to more extreme values of the efficiency



1 gap in either direction, positive or negative, the  
2 probability -- the blue dots are going down  
3 meaning that the probability of or the proportion  
4 of plans that are recording a value of the  
5 efficiency gap in excess of that threshold is  
6 getting smaller and smaller, right. It's a more  
7 extreme event, all right, to record an efficiency  
8 gap -- let's go right out, say, on the left-hand  
9 side of the chart out to say a negative .10. At  
10 that point we see the blue square there is down  
11 now below .2; roughly about 18 percent of plans  
12 recording an efficiency gap estimate in excess to  
13 the left, in this case of negative .10, and the  
14 corresponding number out on the right of the chart  
15 is a positive .10, you know, about 14 percent of  
16 plans record a value in excess of that. So  
17 straight away we see that extreme values of the  
18 efficiency gap are relatively rare, all right.

19 And then there's a second quantity plotted,  
20 and that's the quantity in red. And then that  
21 asks conditional on having -- so now we're looking  
22 at a plan and we're looking at the sequence of  
23 efficiency gap estimates that are racked up over  
24 the life of a plan. And so now let's just take  
25 the case at negative .10. Conditional on one

1 plan, at least one plan exceeding negative .10, of  
2 the set of plans that trip that threshold, what's  
3 the probability that in the same plan we'll get an  
4 estimate of the efficiency gap that's actually  
5 positive, right, it is on the other side of zero,  
6 all right. And you can see the general pattern is  
7 that that goes down as well as the threshold  
8 becomes more stern.

9 So in the case of negative .10 where I've  
10 referred us on Figure 27, conditional on seeing  
11 one efficiency gap estimate at negative .10 or  
12 even more extreme, the probability that we'd also  
13 see an estimate, a positive, right, sort of a  
14 different signal, right, advantage going the other  
15 way, positive advantage going the other way, that  
16 probability is about 15 percent and so on. So you  
17 can see that that probability continues to track  
18 down as we get further out into the tails of the  
19 distribution of efficiency gap estimates.

20 Q Focusing on the blue ones, are these values in --  
21 are they absolute values or does the sign matter?

22 A Sign matters in this graph with respect to the  
23 horizontal axis. But since what's been plotted on  
24 the vertical axis here is a proportion, that's  
25 always going to lie between zero and one on the

1 vertical axis.

2 Q Sure. We looked at the negative .10 in the blue  
3 and it looks like there's I think you said  
4 18 percent of plans would have an efficiency gap  
5 in excess of that.

6 A Uh-huh.

7 Q If we also look at the .1 positive for the  
8 democrats --

9 A Yep.

10 Q -- and there's another, I don't know what that is,  
11 15 percent?

12 A Yeah, let's call it, sure.

13 Q So would that mean that in total when you're  
14 looking at the absolute values, that 33 percent of  
15 plans have a value greater than .1?

16 A Thirty-three percent of plans will, over the whole  
17 analysis, have recorded at least one efficiency  
18 gap estimate greater than .10 in magnitude.

19 Q And then I take it the same -- when we look at the  
20 red ones as well then, they are also -- the sign  
21 matters where if you look at .1 on the red and you  
22 look at .1 on the -- negative .1 and positive .1,  
23 in order to determine the absolute value of plans  
24 that had one election exceeding that threshold,  
25 you'd have to add those two percentages together?

1 A I just think we have to be very careful with  
2 exactly what the red dot -- it says conditional on  
3 a plan tripping that threshold, what's the  
4 probability of a sign flip. And so provided we  
5 keep that interpretation very foremost in our  
6 minds, that's right. Conditional in exceeding  
7 positive .1, there's about a 37 percent chance it  
8 would flip back over to the negative side.  
9 Conditional on going below negative .1, there's  
10 about a 15 percent chance it would flip and see  
11 something on the positive side?

12 Q And if I look at the efficiency gap thresholds,  
13 the positive efficiency gap thresholds for the red  
14 plotted squares, I'm just noticing that the shape  
15 looks a little different from --

16 A Yeah.

17 Q -- when you look at the negative efficiency gap.  
18 Can you explain what the difference in the shape  
19 means?

20 A Yeah, that was a very interesting feature of the  
21 analysis. The interpretation of that is that,  
22 okay, remember what a positive efficiency gap  
23 means, that's advantage for democrats. What this  
24 says is that a plan that trips that threshold  
25 indicative of -- you know, let's go right out,

1 let's go out to .10, that's substantial advantage  
2 for democrats it would appear. The probability  
3 that we will, over the life of the plan we will  
4 also see an efficiency gap estimate indicating  
5 republican advantage is reasonably large, it's  
6 about 40 percent.

7 So there's an asymmetry here that the signal  
8 as it were or a single efficiency gap estimate  
9 tripping this threshold of .10 or of democratic  
10 advantage is not especially reliable or not as  
11 reliable as the signal on the other side. Plans  
12 that when we're getting indications of democratic  
13 advantage, at least over the data available to us,  
14 it appears that that's not a durable feature -- as  
15 durable a feature of the underlying plan as is the  
16 signal, the opposite signal, and that is saying  
17 negative .10, indicative of advantage for  
18 republicans. That tends to be a more durable  
19 feature of a plan.

20 So the take away there is that democratic  
21 advantage or apparent democratic advantage from  
22 any given reading of the efficiency gap isn't as  
23 durable, as reliable as the opposite signal. So  
24 these negative efficiency gap estimates tend to  
25 recur, are more likely to recur, to stay negative,

1 than a positive estimate of the efficiency gap.  
2 That's far more likely to flip back and cross the  
3 road to the other sign.

4 Q There's a somewhat similar figure on Figure 28,  
5 Page 59. Maybe you could just explain what the  
6 Figure 28 on Page 59 represents.

7 A Yeah. Now, what I did there, let me just read  
8 carefully. Yeah, so Figure 28 is a replay of  
9 Figure 27 if you will, subset to redistricting  
10 plans from the 1990s forward. So putting the data  
11 from 1970 and 1980 aside, just focusing on more  
12 recent decades, and a couple of things happen.  
13 The red dots if you will even drift a little  
14 higher above the blue dots on the right of the  
15 graph. And the red dots on the left of the graph  
16 come down relative to where they were in  
17 Figure 27.

18 So let me explain that. The reliability of  
19 seeing a single efficiency gap estimate indicative  
20 of democratic advantage is less informative as to  
21 what you're going to see over the life of the plan  
22 than the corresponding signal on the other side  
23 with respect to -- so you saw the same magnitude  
24 of signal with respect to republican advantage. A  
25 single plans that appear to have republican

1 advantage in them, we tend to get a more similar  
2 sequence of efficiency gap estimates out of those  
3 plans than out of plans that at various points in  
4 time seem to be indicative of democratic  
5 advantage. And that is there in the entire data  
6 set, Figure 27, but is even more pronounced in the  
7 analysis that focuses on recent decades as done in  
8 Figure 28.

9 Q So the trend that was seen in Figure 27 shows up  
10 stronger when you look at just the data from 1991  
11 to the present?

12 A That's correct.

13 Q Okay.

14 A Well, the asymmetry in Figure 27 is more  
15 pronounced in Figure 28.

16 Q Okay. And if we look at like some specific  
17 numbers on Figure 28, just using the positive .1,  
18 looks like there's, you know, about a 56 percent  
19 or something chance that there will be one  
20 election over the course of the plan that would  
21 have a negative sign; is that correct?

22 A Yeah, that's the correct interpretation.

23 Q Okay. But then if we look at the republicans at  
24 negative .1, there's maybe only a 14 percent  
25 chance or something that there's an election with

1 a positive sign?

2 A That's correct.

3 Q Moving on to Page 60 and Section 10.1, it's titled  
4 Conditioning on the first election in a  
5 districting plan.

6 A Right.

7 Q Can you just explain what conditioning on the  
8 first election in a districting plan means?

9 A Right. So here I tried to put myself in the shoes  
10 of litigants frankly and people trying to  
11 adjudicate these matters. And that is it's fine  
12 for me as an analyst to come through and look at  
13 these historical data and get to observe all five  
14 elections, up to five elections that we may  
15 observe over the life of a plan. But people that  
16 want to take issue with a redistricting plan, the  
17 idea we have to wait to see with the five  
18 elections -- you know, typically if you're going  
19 to intervene, you've got to intervene early before  
20 we've seen much data at all from the plan, the  
21 election results the plan is throwing off.

22 So what I set about to do was to ask how  
23 informative is the signal we get from the first  
24 efficiency gap reading under a plan. So in  
25 particular, what can you take away from the fact



1           that there's a new plan in place, we see the first  
2           election under that plan, and it generates a  
3           positive efficiency gap reading or negative one.  
4           So how much can you rely on that particular number  
5           as a characterization of what you would see over  
6           the life of the plan. How much does the first  
7           election or the efficiency gap estimate produced  
8           under the first election tell you about the plan.  
9           And in particular, what's the critical threshold  
10          of -- how big does that first efficiency gap  
11          estimate have to be before you can feel confident  
12          that you're seeing something about a plan that is  
13          not a one-off or a fluke, that you've seen  
14          something that gives you enough confidence to  
15          believe this plan is manifesting advantage one way  
16          or the other. That's the goal of this part of the  
17          analysis.

18        Q    Okay. And then is your analysis of conditioning  
19              on the first election in a districting plan  
20              contained in Figure 29?

21        A    That is one of the graphs that summarizes the  
22              results of this analysis.

23        Q    And Figure 29 contains the results from all the  
24              elections that you looked at?

25        A    Yes, that's 1972 to the present.

1 Q And why don't we just go ahead again and explain  
2 what the graph means, both the blue dots and the  
3 red dots.

4 A Okay. So the blue dots and the red dots have the  
5 same interpretation, an analogous interpretation  
6 to the previous discussion. But this time now  
7 that the event is the efficiency gap reading we  
8 get out of the first election under the plan.

9 So let's take an example. Let's say we're at  
10 negative .10 on the horizontal axis and we see the  
11 blue dot tells us -- the height of the blue dot,  
12 right, we read over against the vertical axis,  
13 tells us that about eight percent of districting  
14 plans have a first election efficiency gap reading  
15 at that level or more extreme to the left in a  
16 negative direction. All right. So that's the  
17 blue dot.

18 If we went out to the corresponding blue dot  
19 on the positive side, we would get, you know, it's  
20 almost the same number actually. The proportion  
21 of plans that have as their first efficiency gap  
22 reading .10 or more or larger, more positive, is  
23 about eight percent.

24 Now, the red dots, all right. Now,  
25 conditional on having seen the blue dot event,

1       that is a first election under the plan with an  
2       efficiency gap at least as extreme as where we are  
3       on the horizontal axis, then how many of that set  
4       of plans, what's the proportion of them that go on  
5       over the life of the plan to produce an efficiency  
6       gap estimate of the opposite sign.

7             And so at negative .10, eight percent of  
8       plans begin life with an efficiency gap reading  
9       that large or more extreme. Of that eight  
10      percent, about -- what is that, that looks about  
11      just reading off the graph, I don't have the exact  
12      number, I'm reading off the graph -- but about 12  
13      or 13 percent of them go on over the life of the  
14      plan to produce an efficiency gap reading that  
15      conveys a different message, all right, would  
16      convey in this case democratic advantage. So the  
17      plan opens up with the first reading is negative,  
18      that's republican advantage. Of the set of plans  
19      with sending an extreme signal like that or as  
20      extreme as that one, 12 or 13 percent of them flip  
21      sign.

22             We go out and we do the same exercise on the  
23      right-hand side of the graph. At .10 we're  
24      talking about eight percent of plans open up with  
25      apparent democratic advantage that large or

1 larger, but of that eight percent, 40 percent of  
2 those go on to produce an efficiency gap estimate  
3 over the life of a plan that sends the opposite  
4 message; that is, would send a message consistent  
5 with a republican advantage.

6 So again, the take away there is a similar  
7 one to what we saw in the earlier graphs, and that  
8 is this asymmetry here, how reliable a signal that  
9 first efficiency gap reading is. It's far more  
10 reliable as to what you're going to see over the  
11 life of the plan if it's indicating in the first  
12 election republican advantage than the reliability  
13 we get from an initial reading that points us in  
14 the direction of saying we've got a democratic  
15 advantage. Democratic advantage doesn't seem to  
16 be as durable as republican advantage.

17 Q In looking at the plans that were analyzed here,  
18 did you include plans from the 2010s where you  
19 have two elections? Are they a data point here or  
20 not?

21 MR. EARLE: I'm going to object to  
22 the form of the question only because you're  
23 asking if there were two elections in 2010?

24 MR. KEENAN: No.

25 Q Like, for example, Wisconsin has a 2012 election

1 and a 2014 election. You could condition a test  
2 on that 2012 election, but there's only one  
3 subsequent election for which it could possibly  
4 flip signs. And I was just wondering if those  
5 2012, 2014 elections are represented in this  
6 Figure 29 data or not?

7 A I would want to consult my R code or my lab notes  
8 on that one before I answered one way. I take the  
9 point, right, given only two elections, and I know  
10 at other points I've restricted analyses of the  
11 plans for three or more elections. So I would  
12 need to consult my notes on that.

13 Q Would you be able to do that? I mean, we don't  
14 need to do it right now. But your computer is  
15 here, would you be able to do that during the  
16 course of the deposition, like on a break?

17 MS. GREENWOOD: Yeah.

18 MR. EARLE: Yeah, he can go in the  
19 R code and look at that.

20 MR. KEENAN: Okay.

21 Q We don't need to do it right now, we can do it at  
22 a time that works.

23 A Okay.

24 MR. EARLE: Do you want to mark the  
25 question so when we come back, we can

1           respond?

2    Q    And then looking at, for example, the negative .1  
3           percent efficiency gap and then the positive .1  
4           percent -- or not percent, .1 efficiency gap, we  
5           had about eight percent for each of those numbers.  
6           Does that mean that in total about 16 percent of  
7           plans had an efficiency gap as an absolute matter  
8           that were greater than .1?

9    A    That's right.

10   Q    And the same would hold true for if we're trying  
11          to find absolute values for any one of these  
12          efficiency gap thresholds, we'd have to add the  
13          percent in on both the positive and the negative  
14          side?

15   A    That's right.

16   Q    Looking at these dots, just for example, like are  
17          the dots on hold numbers or are they on a certain  
18          percentage --

19   A    Oh, yeah, they're on a grid, yeah. So literally  
20          the R code shifts that threshold in discrete steps  
21          out from zero.

22   Q    And I was just sort of curious. For example, like  
23          the first one to the left of one, is that at a --  
24          are those at particular places like .25 or .5 or  
25          is it -- or maybe I could just ask you if you know

1 if they're at particular value points?

2 A They're in steps of .005.

3 Q Okay. So to get to .01, we're at the second dot?

4 A That's correct.

5 Q Okay. All right, makes sense. And that would be  
6 the -- is that the same for the ones we looked at  
7 before, Figure 27?

8 A Yeah, that's right, that's right.

9 Q Okay. Now, looking at Figure 30, what does  
10 Figure 30 represent?

11 A Figure 30 is a rerun of Figure 29 but subset to  
12 data 1991 onwards again, this idea of separating  
13 out what's been going on in recent decades from  
14 the entire historical analysis.

15 Q And what changes did you see when comparing the  
16 post 1990 data to the entire data set?

17 A Sure. Well, for one thing, there are fewer plans  
18 that open with as large advantage to democrats.  
19 So if you were to look at the right-hand side of  
20 Figure 29 and compare it with the right-hand side  
21 of Figure 30, you'd see that the blue, the  
22 distribution of blue squares is pushed down the  
23 graph in Figure 30, right.

24 So now let's take that number we were playing  
25 with earlier, the .10. The proportion of plans in

1 recent decades that begin life with an efficiency  
2 gap that advantageous to democrats or even more  
3 advantageous is down to about five percent,  
4 whereas it was up around eight, nine percent in  
5 earlier decades.

6 The other thing you see is that on the  
7 left-hand side of the graph, the distribution of  
8 red dots has come down a little bit, and that's  
9 consistent with that initial reading of a  
10 particular efficiency gap reading that you get  
11 from the first election under a plan that appears  
12 to be more durable, a more reliable signal as to  
13 what you'll see over the life of the plan, a more  
14 reliable signal in recent decades than in the  
15 entire data set as a whole. We're less likely to  
16 see plans that initially manifest that level, a  
17 given level of republican advantage go on to  
18 produce a contrary signal over the life of the  
19 plan in recent decades than in the entire data  
20 set.

21 Q And everything we've held before about like the  
22 placement of the dots, that holds for this graph?

23 A Oh, the grid spacing you referred to earlier?

24 Q Yes.

25 A Yes, that's the same. I used the same grid



1 stepping in all the graphs that have this layout.

2 Q Okay. Now, you've proposed I believe a threshold  
3 of seven percent; is that correct?

4 A Uh-huh.

5 Q For an efficiency gap in the first election?

6 A Uh-huh.

7 Q How did you come to that number?

8 A Through the calculations and indeed the graphs we  
9 were just discussing, I set about asking what  
10 would be a threshold such that we're either going  
11 to leave plans unquestioned, right, so plans don't  
12 trigger the threshold at all, or the probability  
13 of them flipping sign is sufficiently low that  
14 we've seen that that first election signal is  
15 sufficient to trigger investigation at a  
16 reasonably high level.

17 Now, by reasonably high, I chose a  
18 conventional 95 percent standard; that's fairly  
19 typical in the social sciences. And indeed, you  
20 know, went a little bit beyond that. If anything,  
21 it's closer to 99 percent. It's roughly 10  
22 percent of plans exceed the threshold, and of  
23 those only 10 percent flip sign. So, you know, in  
24 a sense your error rate there is, you know,  
25 10 percent of 10 percent. It is down to one

1 percent.

2 So I thought -- what I was aiming for was a  
3 fairly conservative standard before on the basis  
4 of just one election we could say hey, there's  
5 something to look at here. This is a plan that on  
6 the basis of the first election has sent a  
7 sufficiently strong signal that we ought to take a  
8 closer look.

9 Q But the key fact you're trying to project would be  
10 whether the efficiency gap would flip sign  
11 throughout the course of the plan?

12 A That's right. And I relied on the historical  
13 analysis that we were just talking about to come  
14 up with a threshold.

15 Q Did you think that there should be a different  
16 threshold for positive versus negative efficiency  
17 gaps given the difference we saw in the durability  
18 between the two?

19 A No, I didn't. I thought if it was to be a  
20 threshold, it ought to be symmetric with respect  
21 to democratic or republican advantage.

22 Q And just looking at, for example, Figure 29, so if  
23 we look at the blue dots, what's the proportion of  
24 plans that have an EG in excess of negative .07?

25 A That's about -- let me make sure I'm reading the

1 right dot -- that's about 18 percent.

2 Q Okay. And then of that --

3 MR. EARLE: Wait, are you done?

4 Were you done with the answer?

5 THE WITNESS: Uh-huh.

6 MR. EARLE: Okay.

7 Q And then the red dot there would represent the  
8 proportion of those plans that would change sign  
9 over the length of a plan; is that correct?

10 A Of those, how many then go on to flip, yeah.

11 Q And where is the red dot when we look at  
12 negative .07?

13 A Yeah, .22.

14 Q So 22 percent of that 18 percent would change  
15 sign?

16 A Uh-huh.

17 Q And then if we look at positive .07, the blue dot,  
18 where's the blue dot for that?

19 A Yeah, that's about 18 percent as well maybe, yep.

20 Q Okay. And then the red dot is up at -- where is  
21 that, about four?

22 A Forty, yep.

23 Q So using the .07 percent efficiency gap standard,  
24 we find that 18 percent plus 18 percent, so  
25 36 percent of plans would exceed that in their

1 first election?

2 A Yep. I'm going to -- okay, so I'm going to  
3 qualify my answer here because the blue dots are  
4 the single best estimates. There is some  
5 uncertainty around each of them, and the folding  
6 exercise that you're proposing, it's not going to  
7 be strictly additive in the way as you've been  
8 proposing in the questions. That would come out,  
9 and indeed the confidence interval around that  
10 won't be simply putting the two together. So the  
11 better way to do that would be to compute it with  
12 respect to the absolute value directly rather than  
13 popping it off, reading it off this graph  
14 directly.

15 Q Do you have that absolute value calculated here?

16 A Well, that analysis is the analysis reported in  
17 Figure 32. That takes, that performs that  
18 calculation about the confidence that I was  
19 referring to earlier. So the more appropriate way  
20 to get at the level of confidence we have in a  
21 given threshold is summarized by the calculations  
22 that appear in Figure 32 than in this exercise  
23 that we're performing with respect to Figure 29 or  
24 alternatively Figure 30.

25 Q So maybe we could just explain why, why is it

1 better to use the Figure 32 method than the --  
2 A Okay. Because it's taking into account, okay, if  
3 we went down the road we were on with respect to  
4 Figure 29, we would say that 18 percent of plans,  
5 all right, exceed .07 or greater in the first  
6 election, and then of those, 22 percent change  
7 sign. So we'd have 22 percent of 18 which is, I  
8 can't quite do that but we'll call it 20 percent  
9 of 18 if you --

10 MR. STRAUSS: Looks like about  
11 three percent.

12 THE WITNESS: Right.

13 A But again, it's the way the uncertainty  
14 propagates. You want to, you know, once you're  
15 bound on that and you're confidence bound on that,  
16 and to do that you just don't literally multiply  
17 -- you know, you can multiply those two  
18 percentages together and get down to roughly three  
19 percent. But to put a bound on that, you've  
20 actually got to engage in some brute force  
21 computation. And the summary of that brute force  
22 computation is what I produced in Figure 30 and  
23 Figure 32. So we land somewhere close to, you  
24 know, 100 minus three, .97 in Figure 32. And the  
25 bound on that -- by that I mean if we went out

1 to .7, a negative .07 on the horizontal axis on  
2 Figure 32 and project it out, we'd arrive at  
3 roughly that 100 minus three something, close  
4 to .97 there.

5 But the key is that that confidence interval  
6 is, this one is sort of an honest computation if  
7 you will, one that I believe more than just sort  
8 of, you know, reading off numbers from this graph,  
9 multiplying them together and we're not really --  
10 on Figure 29 reading off numbers, multiplying them  
11 together and sort of finger to the wind in trying  
12 to come up with estimates of the corresponding  
13 error rates. Those are computed directly if you  
14 will in Figure 32.

15 Q Sure. Let's go into Figure 32.

16 A Sure.

17 Q Which dot represents the negative .07? Would it  
18 be the first one after that line at 6 or the  
19 second one?

20 A I believe I used the same gridding, yeah.

21 Q So it's the second one?

22 A I believe so.

23 Q And so that's at about 96 percent or .96?

24 A Thereabouts, yeah.

25 Q So what does that mean, that .96?

1 A That means that at that threshold, 96 percent of  
2 plans are either not tripping that threshold or if  
3 they are, they're continuing to produce efficiency  
4 gaps on that side of zero. So it's basically  
5 saying what proportion of plans would be correct  
6 decisions if that was your actionable standard.  
7 And so you'd be wrong, you're going to be wrong at  
8 least according to historical analysis, you know,  
9 let's call it like three plus or minus, not much,  
10 percent of the time, out at that standard. And as  
11 you make the standard more stringent, you can see  
12 there are fewer plans you're going to look at,  
13 right. And so the error rate obviously falls away  
14 to zero meaning our confidence rate goes up  
15 towards 100.

16 Q I think I understand. So any plan that never gets  
17 above or that doesn't start above the .7 threshold  
18 -- .07 threshold, that's undisturbed?

19 A Yeah, right, right, yes.

20 Q And then you're also adding in plans that are  
21 above that threshold but would never change sign  
22 over the course of the term?

23 A Yeah, yeah. And you can go the other way, right.  
24 So suppose we took a really permissive stand and  
25 said hey, if a plan trips -- suppose you took a

1 really small negative reading, you know, you'd be  
2 making errors 20 percent of the time, right. Or  
3 on the other side, a small positive reading, you'd  
4 be wrong, you know, 78 percent -- you'd be correct  
5 78 percent of the time; you'd be making errors  
6 22 percent of the time.

7 So as you push the threshold out, two things  
8 are happening. One, fewer things are tripping it,  
9 but you're also -- because it's a more stringent  
10 threshold, you're more confident that plans are  
11 going to stick. Conditional in the first plan  
12 getting over that hurdle, it's increasingly  
13 likely that subsequent elections under the plan  
14 will be there as well. But I was just hesitant to  
15 read -- I mean, I've done the calculation I think  
16 you were going for directly in Figure 32, you  
17 know.

18 Q Sure. But if we wanted to --

19 MR. EARLE: You were referencing  
20 Figure 29 as you were --

21 THE WITNESS: Figure 29, right.

22 Q If we wanted to calculate just the total overall  
23 percentage of plans that would trigger the initial  
24 threshold, could we look at Figure 29 and look at  
25 whichever threshold you want to pick.



1 A Sure.

2 Q Look at the blue dot and then add the proportion  
3 of plans on both the positive and the negative  
4 side that are in excess of that efficiency gap?

5 MR. EARLE: So your question's  
6 about Figure 29?

7 MR. KEENAN: Yeah.

8 A Figure 29 --

9 Q Yeah, just trying to figure out like instead of  
10 the number of plans where we're confident that  
11 we're right, the number of plans that just would  
12 get swept into this threshold?

13 A Right.

14 MR. EARLE: What's the question?

15 Q How would we determine that from looking at  
16 Figure 29?

17 MR. STRAUSS: I think the question  
18 is how would you determine by looking at  
19 Figure 29 what percentage of plans would have  
20 numbers more than an absolute value of .07;  
21 is that the question?

22 MR. KEENAN: Yes.

23 A Yeah, and the answer is -- the answer is if you're  
24 looking at the first election, the answer is over  
25 the entire historical period, 18 percent of plans

1       have a first efficiency gap reading in excess of  
2       that.

3       Q    On the negative side?

4       A    Yes, sir.

5       Q    But then on the positive side, we'd have to look  
6       at that one as well?

7       A    Yeah.

8       Q    And then for each, if we want to change that  
9       threshold from .07 to .1, we could run that same  
10      exercise just looking at the dots on this --

11      A    That's right, that's right. That's what the graph  
12      is reporting, the proportion of plans with a first  
13      efficiency gap reading at or beyond the specified  
14      threshold on the horizontal axis.

15      Q    And if we go to Figure 30, this represents the  
16      same data we were looking at in Figure 29 but just  
17      for the 1991 through the present?

18      A    Yeah, yeah.

19      Q    So if we wanted to do the same thing and find out  
20      how many plans triggered -- what proportion of  
21      plans triggered the threshold, we would have to  
22      look at the blue dots --

23      A    That's right.

24      Q    -- on each side of the zero, correct?

25      A    Uh-huh. Yeah, so quite a few plans trigger that

1 on the left, not many. That's a far fewer  
2 proportion than --

3 Q On the left it looks like --

4 MR. EARLE: Finish your answer.

5 A On Figure 30 at negative .07, right, we're at  
6 about 22 percent. At positive .07 we're at about,  
7 what's that, about 12 percent.

8 Q So that's 34 percent total of plans are in excess  
9 of the .07 efficiency gap?

10 MR. EARLE: Are you asking him to  
11 confirm that?

12 MR. KEENAN: Yes.

13 MR. EARLE: He's asking if what he  
14 just said is correct. Can we have the court  
15 reporter read it back?

16 (Question read)

17 A Yes.

18 Q All right. Let's move on to the -- okay, just  
19 maybe to clear up, Figure 33, that looks to be an  
20 analogous graph to Figure 32 but just using the  
21 data from the 1990 plans to the current?

22 A That's right.

23 Q So everything we talked about in Figure 32 we can  
24 transfer over to Figure 33?

25 A That's right, with the caveat that the data in

1 Figure 33 covers latter decades.

2 Q Let's go to like number -- well actually, it's  
3 12:30. I don't know if you guys want to take a  
4 break or --

5 (Discussion off the record)

6 (Recess)

7 Q So we're back on the record. And we had an  
8 earlier question that, Professor Jackman, you said  
9 you didn't know and you wanted to consult your  
10 R code on the answer. And I was asking you about  
11 in Figure 29 whether this calculation that  
12 conditions certain things on the first election in  
13 a cycle, whether the elections from 2012 and 2014  
14 were included in this data set. You've had a  
15 chance to look at your R code and what is your  
16 answer to that question?

17 A The answer is yes, elections from 2012 and 2014  
18 are included in this analysis, this part of the  
19 analysis.

20 Q All right. So we can go back to Page 69 which  
21 deals with the Wisconsin plan.

22 A Uh-huh.

23 Q What did you conclude with respect to Wisconsin's  
24 plan that was enacted for the 2012 election?

25 A The Wisconsin plan 2012, and we've had two

1 elections under that plan, 2012 and 2014, has  
2 produced efficiency gap estimates of negative .13  
3 in 2012 and negative .10 in 2014. Those are large  
4 and negative -- large, negative estimates of the  
5 efficiency gap.

6 Q In determining the efficiency gap for Wisconsin in  
7 2012, what did you calculate the democratic share  
8 of the vote to be?

9 A After imputations for uncontestedness, 51.4.

10 Q And 2014, did you calculate it to be 48.0 percent?

11 A That's correct.

12 Q And if we wanted to visualize that, if we go back  
13 to Figure 4 on Page 18 --

14 A Yeah.

15 Q So if we go to -- we'd have to estimate sort of,  
16 but where 51.4 percent is, that shows that the --  
17 we would have to see where the orange line,  
18 Page 18 --

19 A Yeah, I'm trying to --

20 MR. EARLE: Yeah, but wait for a  
21 complete question, though. I think he's  
22 trying to frame the question, hasn't gotten  
23 it out yet.

24 Q So I was just trying to figure out how we could --  
25 so the orange line would say that with

1 51.4 percent of the votes, the democrats should  
2 receive I'm not sure exactly but perhaps, you  
3 know, 53, 55 percent of the vote. Do you know  
4 exactly what they should receive with 51.4 percent  
5 of the votes?

6 MR. EARLE: I'm going to object to  
7 the form of the question. Go ahead and  
8 answer it if you can.

9 A I can answer the question under the scenario the  
10 maintained hypothesis of a zero efficiency gap.  
11 So under a zero efficiency gap, should democrats  
12 win 51.4 percent of the vote, we can infer that  
13 they should win -- and it's pretty simple but I'll  
14 look up the exact formula. So they've exceeded  
15 50 percent of the vote by .14 or .014 so  
16 that's .028, should be that they should bring  
17 52.8 percent of the seats.

18 Q With 51.4 percent, did they exceed by 1.4 percent?  
19 I thought you used a .014.

20 A I was converting that 1.4 percent to a proportion.

21 Q Okay, that makes sense. I should assume that you  
22 know how to do this better than I do, so that my  
23 mistake. And so 51.4 percent of the votes  
24 translates to 52.8 percent of the seats?

25 A Under the maintained hypothesis of the zero

1 efficiency gap, yes.

2 Q And to determine the efficiency gap -- I guess,  
3 sorry, just scrap all that. What percentage of  
4 seats did the democrats win in the 2012 election?

5 A They won 39 of 99 seats or 39.4 percent of the  
6 seats.

7 Q So then is the efficiency gap equivalent to  
8 subtracting 39.4 percent from 52.8 percent?

9 A The efficiency gap is equivalent to subtracting --  
10 to be perfectly explicit and if you don't mind,  
11 I'll work in proportions. So it's .394 minus .5  
12 minus two times .514 minus .5. And so if you do  
13 that you should get negative .13.

14 Q And you round to the tenth?

15 A Yeah. When I'm reporting negative .13 and  
16 negative .10 in the report and in testimony, I'm  
17 rounding to digits of precision.

18 Q Looking at Figure 35, what's represented on  
19 Figure 35?

20 A Figure 35 presents a sequence of efficiency gap  
21 estimates for Wisconsin arrayed left to right from  
22 1972 to 2014. Each plotted point is the estimate  
23 of the efficiency gap, and the vertical bars  
24 indicate the size of the 95 percent confidence  
25 interval accompanying each estimate.

1 Q And if we look at that, looks to me that the last  
2 positive efficiency gap that Wisconsin saw was in  
3 199 -- is that 1994?

4 A That last positive point estimate was 1994.

5 Q That's a good point, the positive point estimate  
6 was 1994. 1996 the point estimate is a negative  
7 efficiency gap; is that correct?

8 A The point estimate is negative.

9 Q But the confidence interval spans to the positive  
10 side?

11 A That's right. That is indistinguishable from zero  
12 at conventional levels of statistical  
13 significance.

14 Q Then from 1998 onwards, would you say that  
15 Wisconsin has experienced an unambiguously  
16 negative efficiency gap?

17 A Yes.

18 Q And none of the confidence intervals go to the  
19 positive side?

20 A And indeed terminate considerable distance in  
21 negative territory.

22 Q Okay. You calculated an average efficiency gap  
23 for the elections conducted under the 2000s plan  
24 for Wisconsin; is that correct?

25 A Yes.



1 Q And Table 1 indicates that's a negative .076?

2 A Could you point me to the page, please?

3 Q Sure, Page 55.

4 A That's correct.

5 Q Maybe we could just use this graph to explain how  
6 that average is calculated.

7 A Oh, okay. So that is an average of the point  
8 estimates that begin 2002 and run through '04,  
9 '06, '08 and '10. And taking into account the  
10 uncertainty associated with each point estimate,  
11 then computing an average and the uncertainty in  
12 turn inducing a confidence interval around the  
13 average.

14 Q Okay. And then Figure 36, what does this  
15 represent?

16 A Figure 36 presents the efficiency gap estimates  
17 observed in states in the most recent round of  
18 redistricting. So for the states here it's  
19 typically just a pair of elections; just two  
20 elections have been held under the redistricting  
21 plan. And the solid square indicates an  
22 efficiency gap estimate, and the confidence  
23 interval is indicated by the gray bar extending  
24 horizontally. And you can see that there are, you  
25 know, two estimates per state. And I've ordered

1 the states by the average level of efficiency gap  
2 for each state from low at the bottom of the page  
3 to high, positive, at the top of the page.

4 Q So Florida had the lowest efficiency gap when  
5 considering the average of the two elections?

6 A That's right.

7 Q Okay. And did you calculate the average here in a  
8 similar manner to the way you calculated the  
9 average we discussed with respect to Wisconsin  
10 in --

11 A Yes.

12 MR. EARLE: You answered the  
13 question before he finished. He was going to  
14 indicate which figure.

15 THE WITNESS: I'm sorry.

16 Q -- Figure 35 during the 2000s period?

17 A Well, there is no average indicated on Figure 35.

18 Q Yeah, but we had discussed it in connection with  
19 that.

20 A That's right.

21 Q So you --

22 MR. EARLE: We want to wait for the  
23 whole question to come out.

24 MR. KEENAN: Yeah.

25 Q You calculated the averages in Figure 36 similar

1 to the way we discussed the way you calculated the  
2 averages for Wisconsin during the 2000s period?

3 A Yes.

4 MR. KEENAN: I'm just going to take  
5 a quick break, make sure I've asked  
6 everything I need to ask.

7 MR. EARLE: Sure.

8 (Recess)

9 MR. KEENAN: Well, we'll go back on  
10 the record just to say that I don't have any  
11 more questions. So thanks for your time this  
12 morning and afternoon.

13 MR. EARLE: We'll read and sign.

14 MR. STRAUSS: And that concludes  
15 the deposition. Thank you very much.

16 (Adjourning at 12:59 p.m.)

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

3 I, MARY L. MIXON, a Court Reporter and Notary  
 4 Public in and for the State of Wisconsin, do hereby  
 5 certify that the foregoing deposition was taken before  
 6 me at the Wisconsin Department of Justice, 17 West Main  
 7 Street, in the City of Madison, County of Dane, and  
 8 State of Wisconsin, on the 20th day of November 2015,  
 9 that it was taken at the request of the Defendants, upon  
 10 verbal interrogatories; that it was taken in shorthand  
 11 by me, a competent court reporter and disinterested  
 12 person, approved by all parties in interest and  
 13 thereafter converted to typewriting using computer-aided  
 14 transcription; that said transcript is a true record of  
 15 the deponent's testimony; that the appearances were as  
 16 shown on Page 2 of the transcript; that the deposition  
 17 was taken pursuant to notice; that said SIMON D.  
 18 JACKMAN, Ph.D. before examination was sworn by me to  
 19 testify the truth, the whole truth, and nothing but the  
 20 truth relative to said cause.

21 Dated November 25, 2015.

22  
 23 Notary Public, State of Wisconsin



24  
 25 *Mary L. O*