Competition and Redistricting in California: Lessons for Reform

An IGS Study Funded by
The James Irvine Foundation

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Introduction

The defeat of California's Proposition 77 marks a new phase in the redistricting reform debate. The fact that this specific measure failed, however, does not imply that the prospects for change are dead. Proposition 77 was perceived as flawed in many specific ways that can be remedied in future proposals. The purpose of this report is to look at the function of redistricting criteria—in particular, political competition—and to derive some lessons that might instruct any future attempts to amend the line-drawing process in California.

There is nothing straightforward or simple about redistricting. Indeed, the process has become more difficult over time as court decisions and new statutes have incrementally added criteria to the initial "one person, one vote" requirement. Redistricting now requires line-drawers to incorporate what we will refer to as primary and secondary levels of criteria. Primarily, redistricting must equalize the populations in contiguous districts, and comply with the Voting Rights Act. These are federally mandated rules that cannot be over-ridden by secondary criteria. The next level of criteria includes rules about compactness, communities of interest and city and county boundaries, nesting and the like that are established by state law or state constitutions. Federal and state court decisions provide explicit guidance in the interpretation of some of these criteria; for example, the equal population criterion for congressional districts has been interpreted to mean that districts can only differ by a few people, far less than 1 percent. Other criteria are more vague and largely left to the line-drawers' discretion.

Over the past few years, the discussion over redistricting principles has focused on a new criterion: competitiveness. The purpose of this project was to discover how many potentially competitive seats could be constructed hypothetically, and then how implementing other criteria affected that number. Given the nature of redistricting law and public expectations, it is not sufficient to simply know how many potentially competitive seats can be drawn. It is also important to recognize the cost of creating competitive seats in terms of other goals such as fairness to racial and ethnic minorities, observing communities of interest, keeping districts compact, and the like.

The following pages report the results of a study funded by The James Irvine Foundation and conducted by the Institute of Governmental Studies at UC Berkeley. In the sections that follow, we:

1. describe the methods of the study;
2. discuss the results;
3. make some recommendations based on what we found.

Our basic conclusion is that the ability to achieve a high level of potentially competitive seats is greatly limited by other redistricting criteria, the uneven political demography of the state and the advantages of money, name recognition, and staff resources that incumbents enjoy in the state legislature and Congress. We recommend against any specific attempt to define competitiveness or to specify a given number of competitive seats in any proposed new redistricting law. Instead, we could recommend that if any language about competitiveness is considered for inclusion in a new law, that it be very general. Because there are so many

different perspectives in this state about fairness and what matters in redistricting, any proposed line-drawing process should have guarantees for the public submissions of proposals, open meetings and a diverse membership.

Method and Research Design

For this study, we used a team of graduate and undergraduate students and one Geographic Information Systems (GIS) Specialist as our technical line-drawing team. Two of the undergraduate students had no previous training in GIS, and only one team member had redistricting experience. This team drew statewide plans for California's Congressional and Assembly districts using specific sets of criteria. Some plans began with the existing majority minority districts, lines, i.e. the status quo; other plans were drawn 'free-hand.' Our team adhered to strict population equality, drawing contiguous districts that were at minimum as compact as the status quo, and in most cases more compact. We then varied three other criteria: maximizing the number of majority minority districts, minimizing the number of county and/or city splits and maximizing the number of competitive seats. Altogether we drew over 30 statewide Congressional plans and 21 Assembly plans.[1] In the process, we considered multiple definitions of competitiveness and majority minority districts. We did not use incumbent addresses or take geopolitical bases into consideration. We report 2000 registration figures to make it easier to compare our plans to the current districts as those are the same data the state used in its last redistricting.

It is important to note that an infinite number of plans can be drawn under even the simplest criteria. Our study does not attempt to provide one answer to a question that has many. We also did not fine-tune our plans to the degree necessary to submit them to the Legislature. For instance, in some of the plans we did not clean up all the small Census place splits. Census places often are non-contiguous and cleaning up a plan can add many hours to a line drawing exercise. We kept the population deviation under 1% but made no attempt to drive it down to one person. Rather, our plans were intended as heuristic devices, illustrating some key points about the trade-offs inherent in redistricting and the likely political effects of new districts. It should be noted that we did not use the Community of Interest criterion in our exercise because it is difficult to impossible to implement without public testimony. We included the drawing of 'square box'-type plans as one of our experiments, to simulate the kind of automated, stripped down redistricting process (compact, equally populated and devoid of potential human/political interference) that some people have argued for over the years.

Our basic findings for Congressional lines are as follows:

1. Plans that balance all the criteria (population equality, contiguity, compactness, minimizing county splits, preserving the VRA seats and enhancing

[1] In addition to these, we also developed more than twenty other plans to examine other hypotheses, such as how the criteria specified in Prop 77 would affect the redistricting process. The Assembly plans developed were also utilized to assess different ways of nesting two Assembly Districts in one Senate district. Results on nesting will appear in a supplemental report. For this report, however, we concentrated on the fifty-two plans developed to examine trade-offs among constraints.

competitiveness) would create between 12 – 14 Congressional seats (13 on average) in the range between a 3 percent Republican registration advantage and a 10 point Democratic registration advantage[2].

2. Districts in that range will be contested more heavily but small registration margins do not necessarily predict turnover since other factors matter significantly such as incumbency, money advantages, national tides and candidate quality. In the redistricting plan drawn by the Court in 1991, only 14 of the 260 California Congressional races (i.e. 5%) between 1992 and 2000 resulted in party turnover.

3. Plans that maximized competitiveness and ignored city/county lines and the integrity of the VRA districts create on average as many as 18 to 25 districts in the potentially competitive range, but they would be subject to serious legal challenges and much controversy in the affected local communities.

4. Political geography and the VRA give the Democrats a big edge in safe seats over the Republicans. No plan, no matter who draws it, can change that. Barring a heavily biased Republican plan, the Democrats are unlikely to drop below 26 seats in Congress and the Republicans could fall to 14.

As for the State Assembly, we found that:

5. Out of eighty Assembly districts, plans that aim to maximize the number of potentially competitive seats could produce between 21 to 30 seats in the 3 point Republican and 10 point Democratic registration range.

6. Among plans that balance all other redistricting criteria, between 12 to 17 seats (15 on average) would fall in that range.

7. Similar to the Congressional races, due to incumbency advantage and other factors, a slim party registration difference does not necessarily translate into a narrow vote margin. Among the 400 Assembly races that took place between 1992 and 2000, only 22 (6%) resulted in party turnover. Ten of these races (45%) occurred in districts with a party registration difference in the 3 point Republican and 10 point Democratic range. Contrary to conventional expectation, none of these party turnover races happened in districts with a party registration difference within 3 percentage points. In fact, several Republican candidates were able to win in districts with high concentration of Democratic voters.

We considered most of the commonly used redistricting criteria and conducted a series of experiments by observing or relaxing some of the constraints. With over fifty plans developed, we came to the following conclusion about trade-offs among those criteria.

[2] We use this range because an evaluation of partisan races during the 1990s shows that inside the 0-3% Republican to 0-10% Democratic advantage range, seats have the highest likelihood to actually turn over. In fact, only two Congressional seats that switched party control did not fall into that range, and they were products of extraordinary circumstances.

8. The conventional belief that majority minority districts tend to be non-competitive and dominated by the Democratic Party still holds. Yet with changing demographic composition and partisan alignment, it is now feasible to draw one or two majority minority districts that might be potentially competitive.

9. Plans that placed a heavy emphasis on compactness and minimizing city/county splits made it hard to achieve the political goals of more competitive seats and preserving majority minority representation.

A Review of Redistricting Criteria

Any single goal in a redistricting will be highly constrained by the other criteria that must be followed to achieve a legal redistricting plan. Meeting one criterion will ultimately lead to a trade-off with another criterion. Below, we briefly explain the most commonly used redistricting criteria.

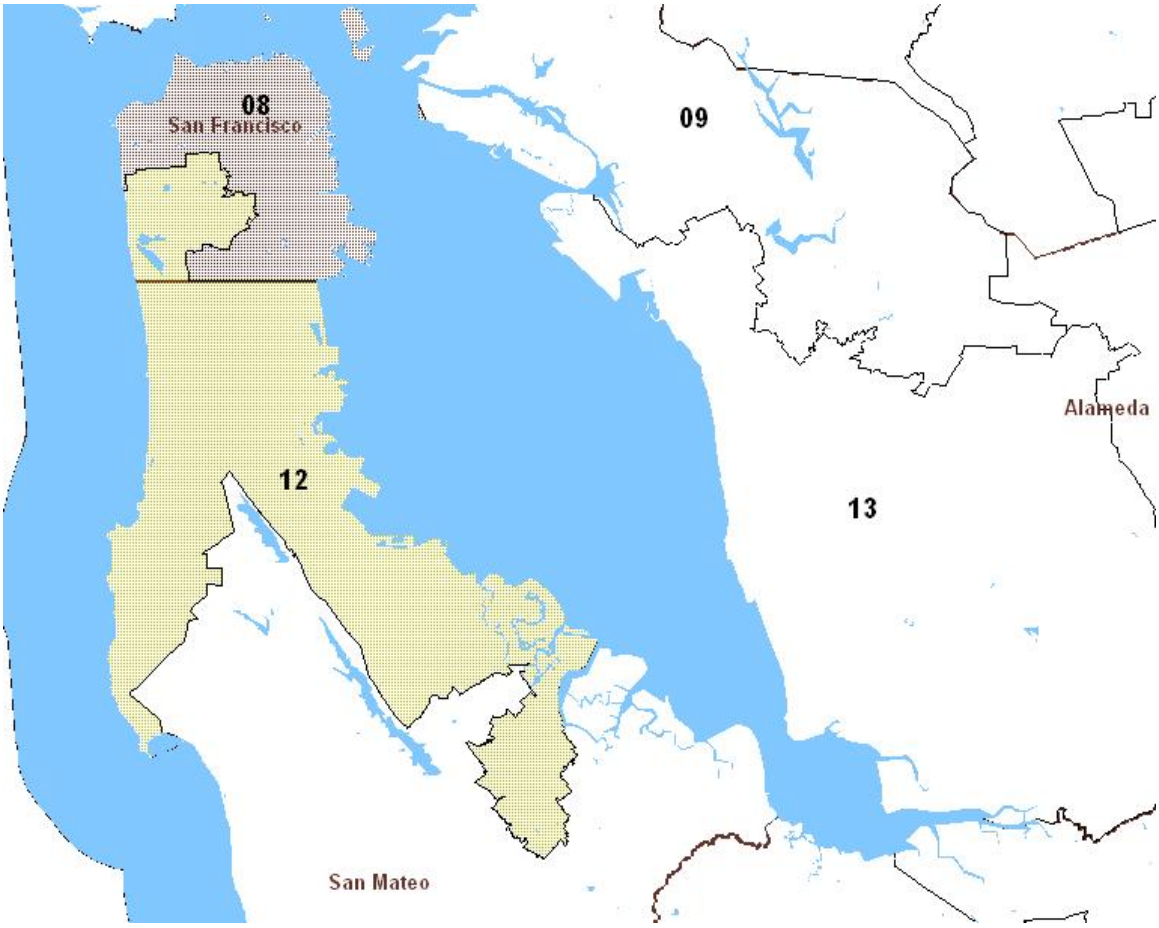
1. Equal Population

Making district populations equal is the rationale for changing district lines at the beginning of each decade. Districts are supposed to be balanced in population to ensure that the one person - one vote principle will not be violated. For example, if one district had 100 residents and one had 1000, the residents of the first district would essentially have 'more' representation than those of the second. Thus a vote in the first district would be valued differently than in the second.

The equal population criterion has become more and more narrowly defined over the past decades. Under current case law, congressional districts are held to 'strict scrutiny' meaning that they can not deviate from the ideal population[3] by more than a few people. For legislative districts, this criterion is not as narrowly interpreted. Most experts will advise keeping deviations below 10 percent, preferably much below that, to avoid claims of malapportionment. Big cities or counties are often split in order to adhere to the equal population requirement. San Francisco County had a total population over 776,000 according to the 2000 Census. Yet the ideal population for a congressional district is only 639,088. Figure 1 shows that the County must be split into two Congressional Districts, Districts 8 and 12.

[3] The ideal population is computed by dividing the total population of the State by the number of districts.

Figure 1. San Francisco County and Congressional Districts 8 and 12.



2. The Voting Rights Act

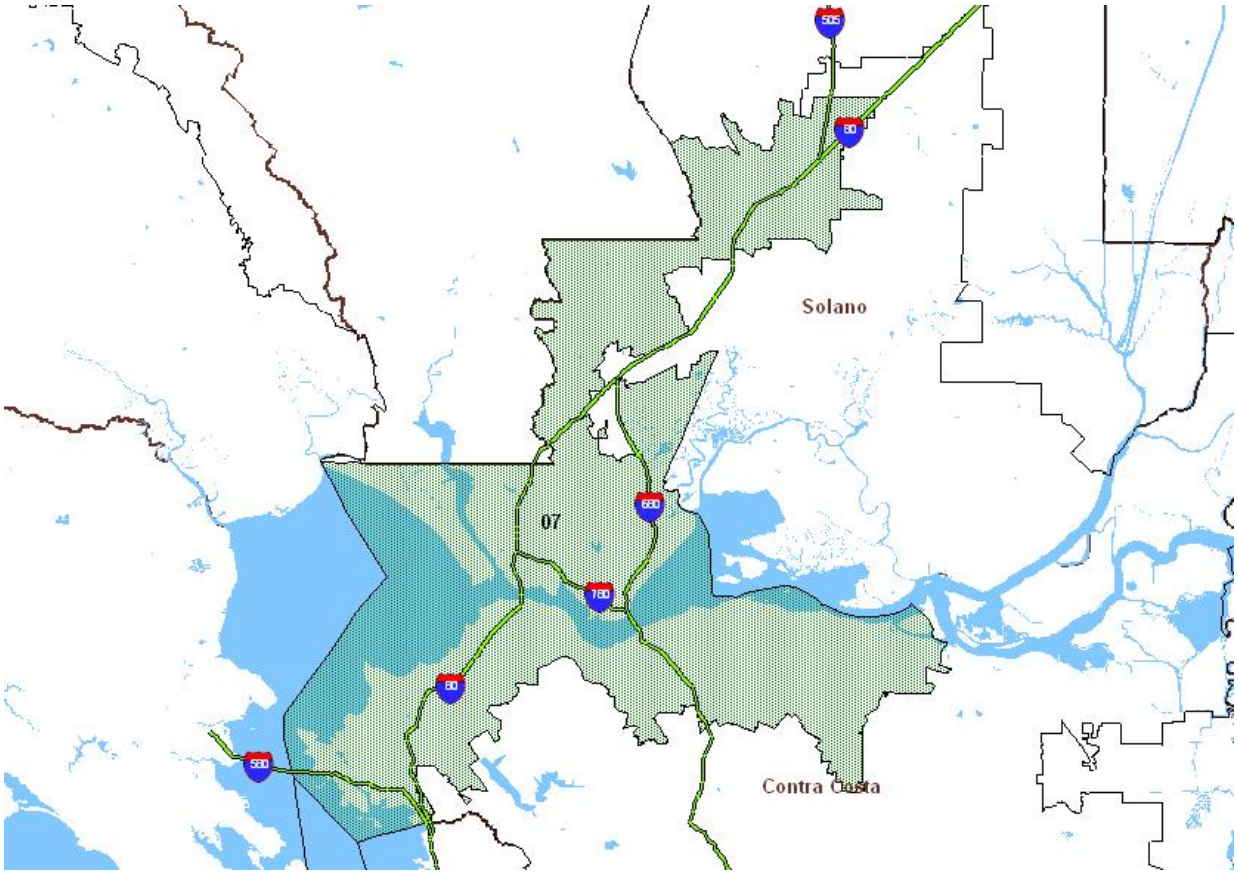
California is 'covered' under Section 5 of the Voting Rights Act (VRA). This means that a redistricting plan must be precleared by the Department of Justice (DOJ) before it can go into effect. The DOJ will evaluate plans for retrogression, i.e. they make sure that minority populations in 4 counties[4], and in districts that are part of those counties, are not weakened in their potential political power under the new district lines. Line-drawers are severely limited in their creativity in those counties. Because these counties and their districts are necessarily part of the congressional plan, the entire State plan is affected and has to be precleared. A redistricting also must not run afoul of Section 2 of the VRA. The simplest explanation of the Section 2 non-dilution standard is that in racially polarized areas in which minority groups constitute a majority in a district, groups should not be split up but rather kept whole.

[4] The counties are Kings, Merced, Monterey and Yuba

3. Contiguity

Contiguity is the most basic of all redistricting criteria, but even it has had its challenges. Some districts are contiguous because they are connected by a bridge. As illustrated in figure 2, the current Congressional District 7 spreads across Solano and Contra Costa county and is connected via the Carquinez and Benicia Bridges. The general rule of thumb is that districts have to be connected in some way, and the more connected they are, the less controversial this criterion is.

Figure 2. Congressional District 7

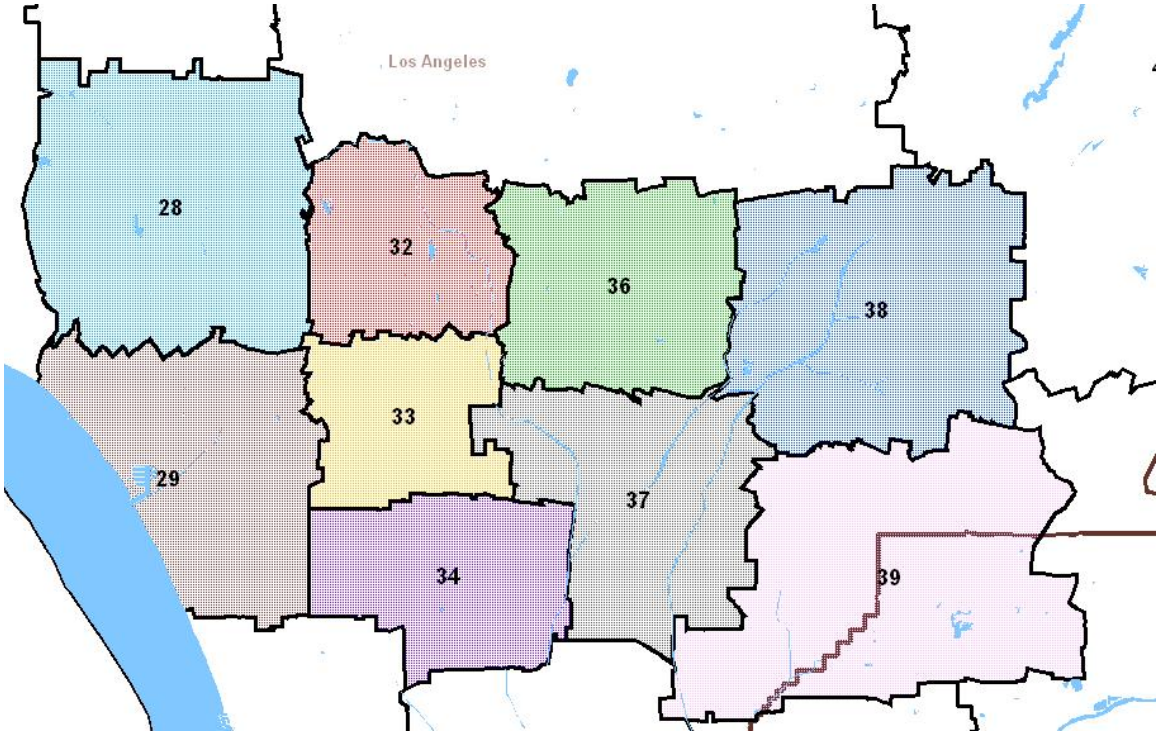


4. Compactness

Compactness, on the other hand, has been interpreted in many different ways. There are currently at least 7 different compactness measures that are commonly used and that are part of the redistricting software we used for this study.[5] When our line-drawers were instructed to draw compact districts, they would, in absence of any compactness measure, attempt to draw box-like districts that did not have too many edges or 'fingers.' Figure 3 shows some illustrations of box-like districts we drew in Los Angeles County, which are more compact than, for example, the District in the above diagram.

[5] Maptitude for Redistricting 4.7, by Caliper Corporation.

Figure 3. Example of Compact, Box-like Districts



5. Respect for City and County Boundaries

This criterion seeks to minimize the number of times that district boundaries split local jurisdictions. A notable point is that many cities are actually not contiguous. Figure 4 and 5 highlight the city boundaries of Bakersfield and Fresno (shaded in green). There are often outlying areas that redistricters need to pick up to keep a city whole. City boundaries are often not very compact. California's counties, while more compact, are in many cases too large to be contained in one district. Some cities are equally subject to mandatory splitting to achieve equally populated districts. For the purpose of this study, as is commonly done in redistricting, we use Census places to mean cities. Census place designations consist of cities and unincorporated areas. There are 1081 Census places in California.

Figure 4. Example 1 of non-contiguous, non-compact city boundaries: Bakersfield

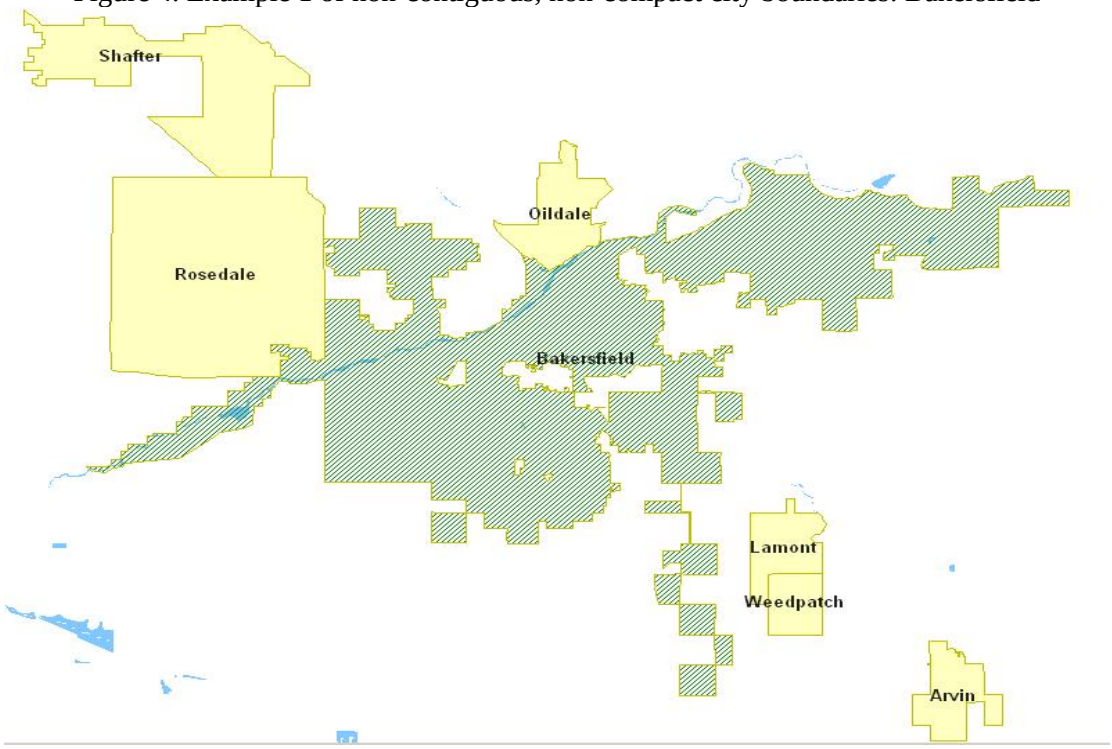
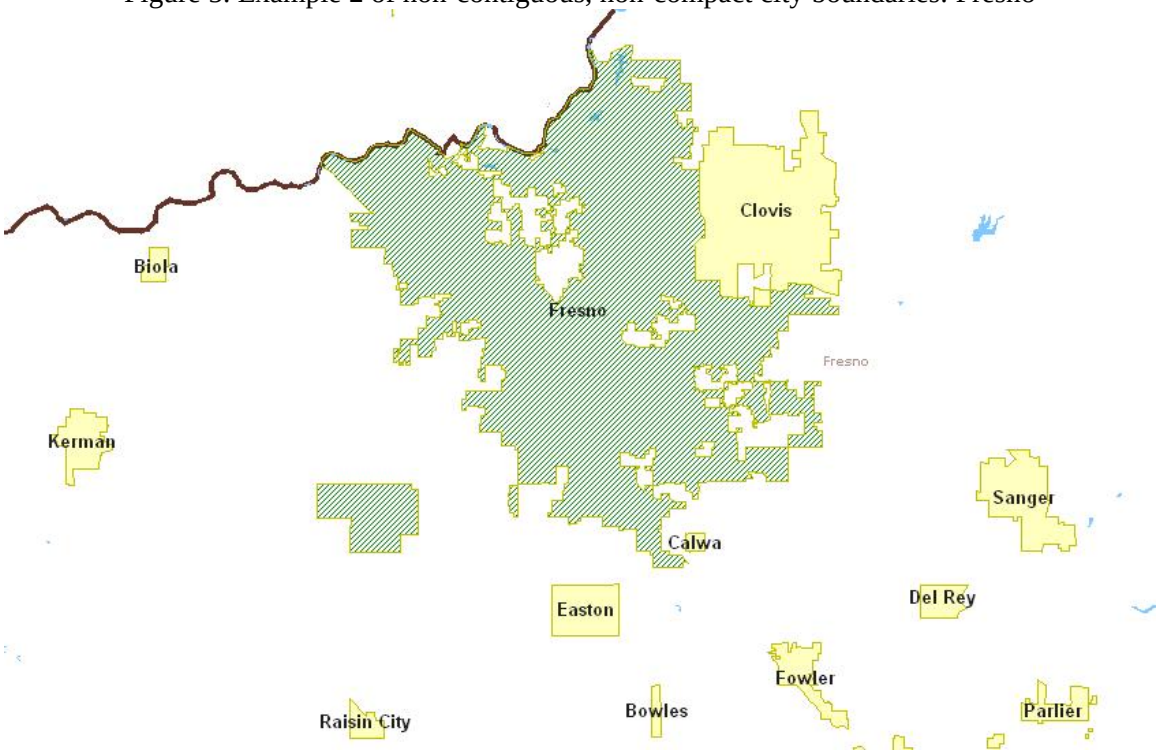


Figure 5. Example 2 of non-contiguous, non-compact city boundaries: Fresno



6. Communities of Interest

This criterion is the most vaguely defined, and the one that is often most important in its application when a decision must be made about where to split a city or a county. At its highest level of application, a community of interest could be a city or a county because of the common interest of a respective jurisdiction. It could also be a region, such as the central valley or the coastal communities. On the smallest level, a community of interest might be a neighborhood, a redevelopment district or an area that encompasses a group of activists advocating for a common goal. A Community of Interest is most often identified during the process of public hearings in which testimony is provided and areas are defined. Groups like the Asian Pacific American Legal Center and the Mexican American Legal Defense and Educational Fund held their own workshops in communities throughout the state during the last redistricting process to collect information under this criterion. Elected officials are also often helpful in providing information about existing communities of interest in their districts. In the absence of current public hearings, testimony and hence available data, this study did not have the benefit of being able to utilize this criterion. Rather than introducing our own biases by including only some Communities of Interest with which we were personally familiar, we decided to exclude this criterion altogether.

Potential and Actual Competitiveness

Competition is the new buzz word when redistricting criteria are discussed. Whether districts could indeed be drawn to be potentially competitive is a complex question that has as much to do with the electoral geography at hand as with the definition of what it means to have a competitive seat. One issue is clear, however: one would be much more successful in drawing potentially competitive seats using political data in the process than one would be if political data could not be used.

The discussion of competition has been grossly oversimplified and the answer of whether a district is indeed competitive is highly nuanced. There are many different measures of competition that have been used. Some evaluate a district based on the party registration of voters, others look at election outcomes. How one assesses a district depends on how one looks at it; for example, is a district competitive within a 3, 5 or 7 percent spread of registration? Given that Democrats tend to have lower level of turnout, should Democratic registration be weighted differently than Republican? And how does the increasing number of voters that decline to state their party affiliation factor into the equation?

In this report, we focus on one measure of competition, the 0-3% Republican to 0-10% Democratic advantage registration range, or simply referred to as the '3-10' range. Using party registration data, we calculate the percentage of registered Democrats and Republicans by dividing the number of registered Democrats (or Republicans) by the total number of registered voters in the district. Then we calculate the difference in party registration. For example, district 1 has 30% registered Republicans and 35% registered Democrats, the difference in party registration is 5 percentage points (35%-30%). In other words, the Democratic Party has a 5 percentage point party registration advantage in this district. If district 2 has 40% registered Republicans and 38% registered Democrats, then the Republican Party enjoys a 2 percentage

point party registration lead. Therefore both districts fall into the 3-10 percent range. Looking at all the districts within a plan, we then count how many districts have a 0 to 10 percentage point Democratic advantage and how many districts have a 0 to 3 percentage point Republican advantage. We arrived at this '3-10' measure via analysis of the Congressional and State Assembly races in the 1990s in California, which show that races within that range of registration are most likely (while still highly unlikely) to experience seat turnover[6]. We also evaluated other measures of competitiveness which we found to be less predictive. (See Appendix I.)

While party registration is the most common measure by which the balance of partisans is assessed, districts that look potentially competitive based on their registration figures do not necessarily predict competitive races. Many factors determine the outcome of elections including incumbency, which can add as much as a 5 to 7 point advantage, the amount of money spent, the quality of the candidates, and the like. As a consequence, even seats with narrow registration margins do not frequently change party hands. On the other hand, seats with registration differences outside of what we have defined as the range of potentially competitive seats occasionally experience party turnover.

During the nineties, a decade in which Congressional races were fought in districts drawn by the court masters, there were 5 cycles of 52 races between 1992 and 2000 for a total of 260 Congressional contests. Of those, only 14 (5%) resulted in a change in party control from either Democrat to Republican or vice versa. Of the 37 races with registration differences of three points or less only 6 (16%) resulted in party change. In fact, 4 of the seats (CD1: Hamburg-Riggs-Thompson: CD15: Mineta-Campbell-Honda; CD36 Harman-Kuykendall-Harman; and CD49 Schenk-Bilbray-Davis) accounted for 8 of the party changes. The other 6 seats only changed once.

The other side of the coin is that seats that do not seem to be competitive on paper can sometimes experience a party turnover. A good example of this is CD1 which never had a Democratic registration advantage of less 13.5%. Yet, Dan Hamburg, a Democrat, lost to Frank Riggs, Republican, in 1994 and the seat was held by the Republicans until 1998 when Democrat Mike Thompson was elected. Here the factor was the division between the Democrats and the Green party. A less dramatic example was Lynn Schenk's victory in 1992 in a seat that was just outside the 3% Republican range (42.8 Republican to 39.12 Democratic) in the so-called "year of the woman."

Because Assembly districts are smaller than Congressional districts, candidates' personalities and political experience sometimes over-ride advantages in political affiliation. Party registration difference becomes relatively less important in predicting the actual competitiveness of races. Out of the 400 races contested between 1992 and 2000 (80 districts by 5 election cycles), only 22 (6%) resulted in party switches. One would expect these party turnovers to have taken place in districts with razor thin party registration difference. The reality was contrary to such expectation. None of the turnover races occurred in districts in which the party registration difference was less than 3 percentage points. Ten turnovers (45%) took place in districts with a

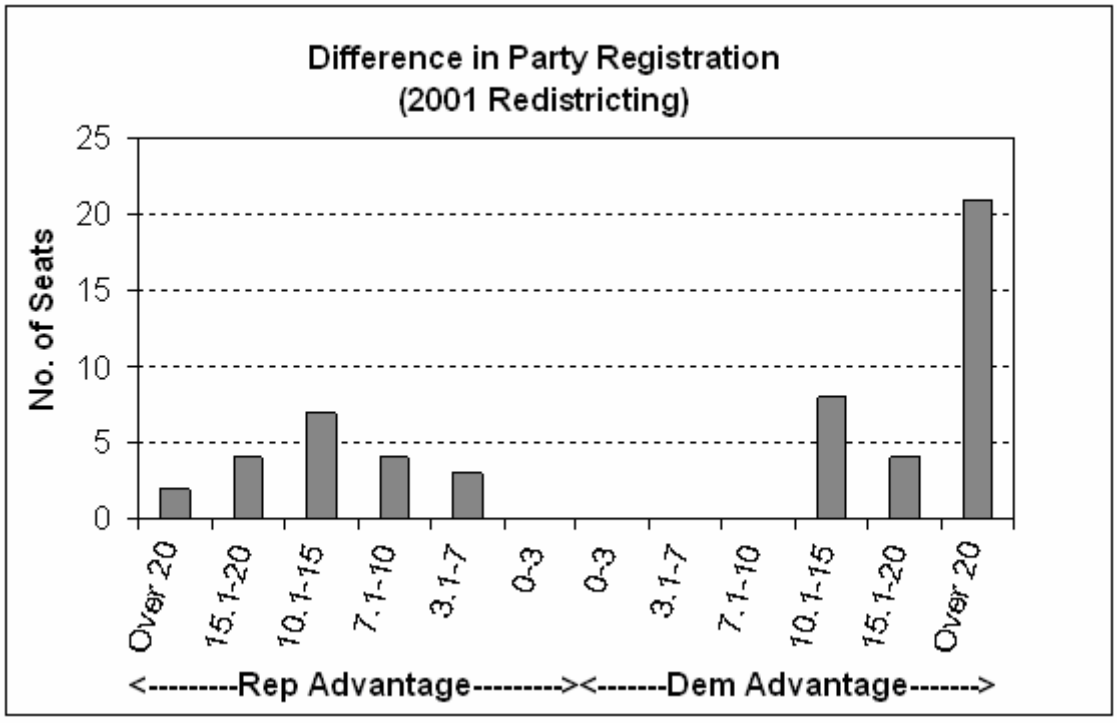
[6] A seat turnover happens when the political party affiliation of the winner switches from one party to another in two consecutive elections. The turnover can be from Democratic control to Republican or vice versa.

0-3% Republican to 0-10% Democratic advantage registration range.[7] Some Republican candidates were able to win in districts with heavy concentrations of Democrats. For example, Bruce McPherson, a moderate Republican, was first elected to the State Assembly District 27 in left-leaning Santa Cruz in 1993. Another example was Brooks Firestone (AD35). He won the seat in 1994 where the Democratic Party had a 9 percentage point lead in registration and received over 65% of the votes in his 2nd term.

Adding Competition — Congressional Level

The 2001 redistricting resulted in a bipartisan plan. This means that the parties compromised and agreed to a fixed share of the seats. To ensure that the seat shares did not change, potentially marginal districts were made safer. This was accomplished by concentrating Democratic voters in districts held by Democrats, and Republican voters in districts held by Republicans, making all previously marginal seats safer. Figure 6 shows the distribution of seats by party registration margins. It clearly shows that the 2001 redistricting contained no seats in the range between the 0 to 3% Republican advantage and 0 to 10% Democratic advantage.

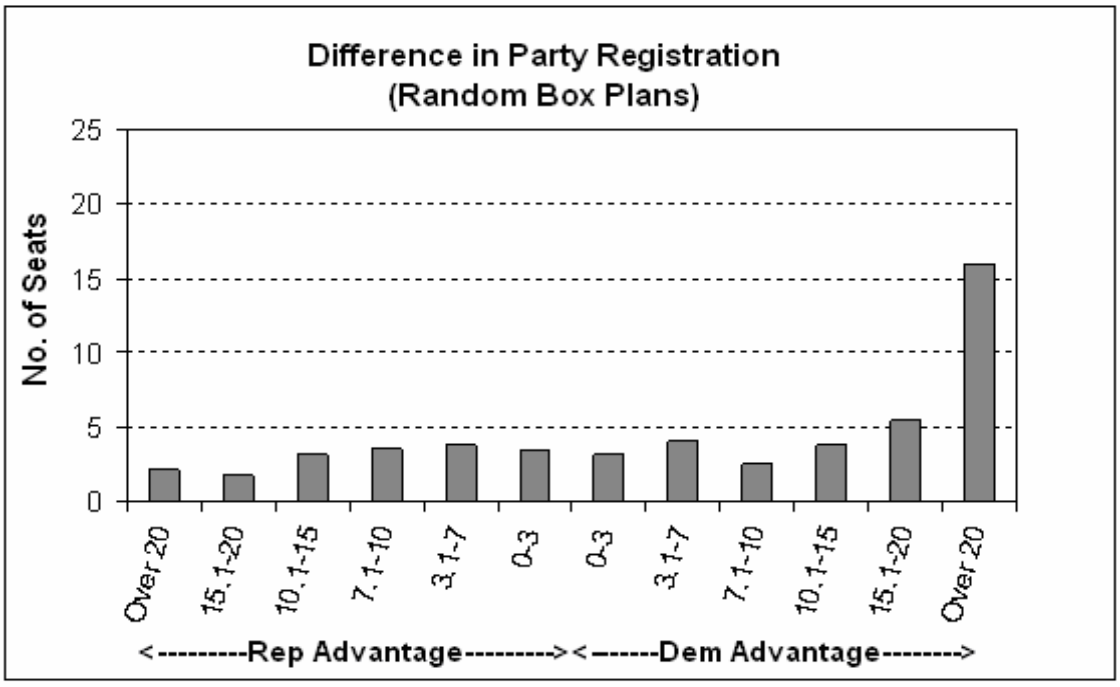
Figure 6: Distribution of Party Registration for current Congressional districts



[7] AD24: Cunneen-R (1998) – Cohn-D (2000); AD25: Snyder-D (1992) – House-R (1994); AD35 O'Connell-D (1992) – Firestone-R (1994) -- Jackson-D (1998); AD43: Rogan-R (1994) – Wildman-D (1996); AD44: Hoge-R (1994) -- Scott-D (1996); AD54: Karnette-D (1992) – Kuykendall-R (1994) -- Lowenthal-D (1998); AD61: Aguiar-R (1996) – Soto-D (1998); AD80 Bornstein-D (1992) -- Battin-R (1994).

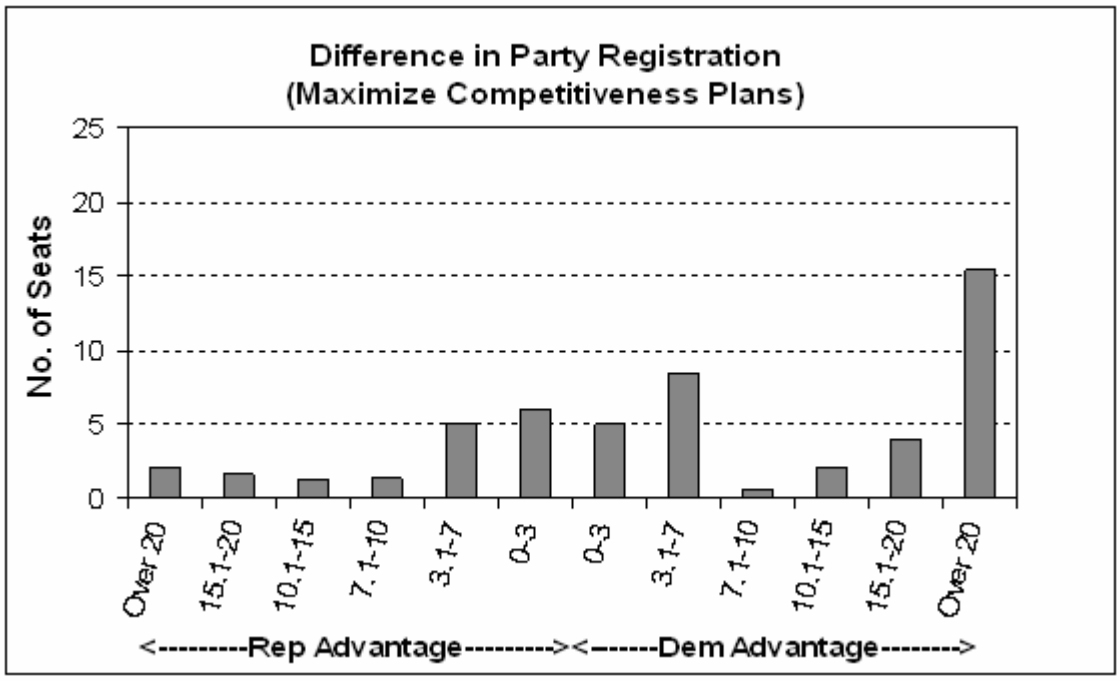
What is the range of possibility with respect to seats in this potentially competitive range? Assuming for illustrative purposes that it would be legal to conduct a minimal redistricting, drawing only equally populated, compact districts, and ignoring all other federal and state considerations, we developed five such plans. We averaged the results from these five plans to examine how many seats would fall into one of the twelve ranges of party registration (used in figures 6 through 13). The average Democratic versus Republican registration differences are displayed in figure 7. On average, these "random box" plans put 13 seats in the potentially competitive range. Another way of looking at this is that this random map-making created 40 safe Democratic and Republican seats: a stark reminder that California's political geography accounts for a large portion of the non-competition in the state.

Figure 7: Random Box Plans - Distribution of Average Party Registration



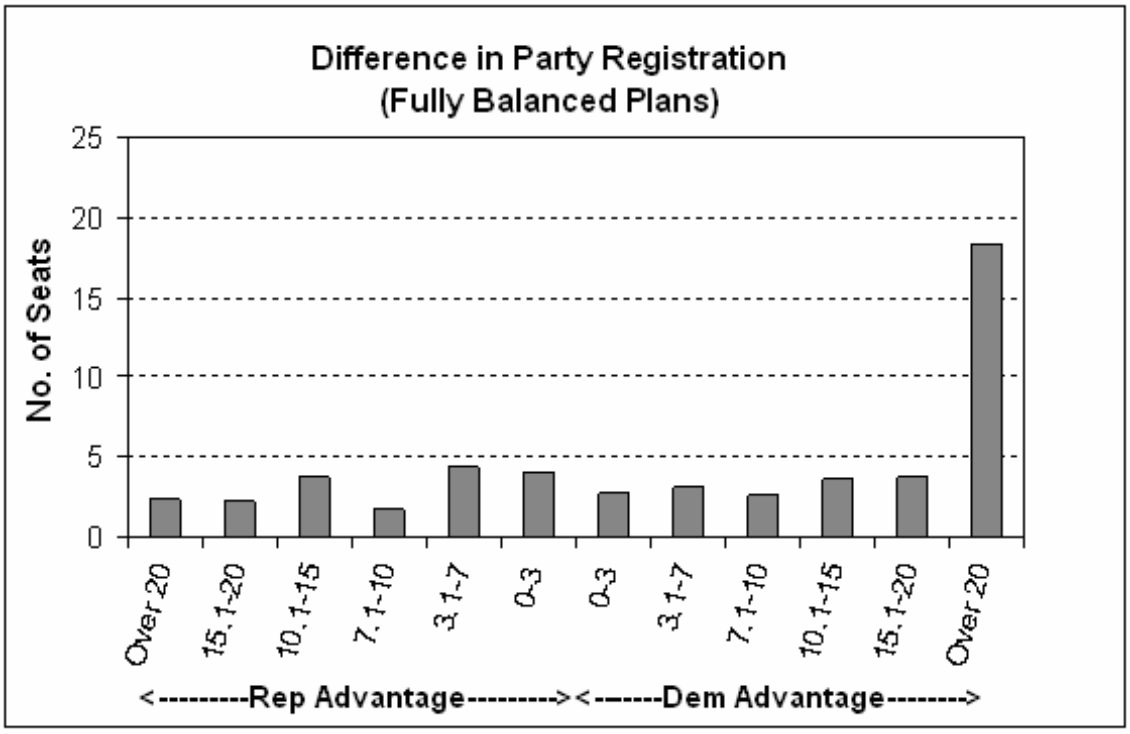
At the opposite end of the spectrum, we created a set of plans that only maximized competition but were subject to equal population and reasonable compactness. A map of this sort would also not be legal, but it does give an idea of the potential upper bound on attempts to create more competitiveness. This is displayed in figure 8. It shows that on average there were 20 seats in the potentially competitive range. Still, even a plan that placed competitiveness above everything else yielded 22 safe Democratic seats and 11 safe Republican ones.

Figure 8: Competitiveness Maximization Plans - Distribution of Average Party Registration



The final illustration of the number of seats that can be created in the potentially competitive range is what we termed the ‘fully balanced’ plan. It is important to keep in mind that even 'fully balanced' in this study does not equate: having considered all applicable redistricting criteria. For this study, we did not include the Community of Interest criterion, which can have an effect on the outcome of any plan. For this exercise, we drew five plans that took into account equal population, kept the existing number of majority minority districts, were reasonably compact, minimized county splits and maximized the number of seats in the potentially competitive range. Even with all of these constraints, we were able to create on average 13 districts in the 3 point Republican to 10 point Democratic range.

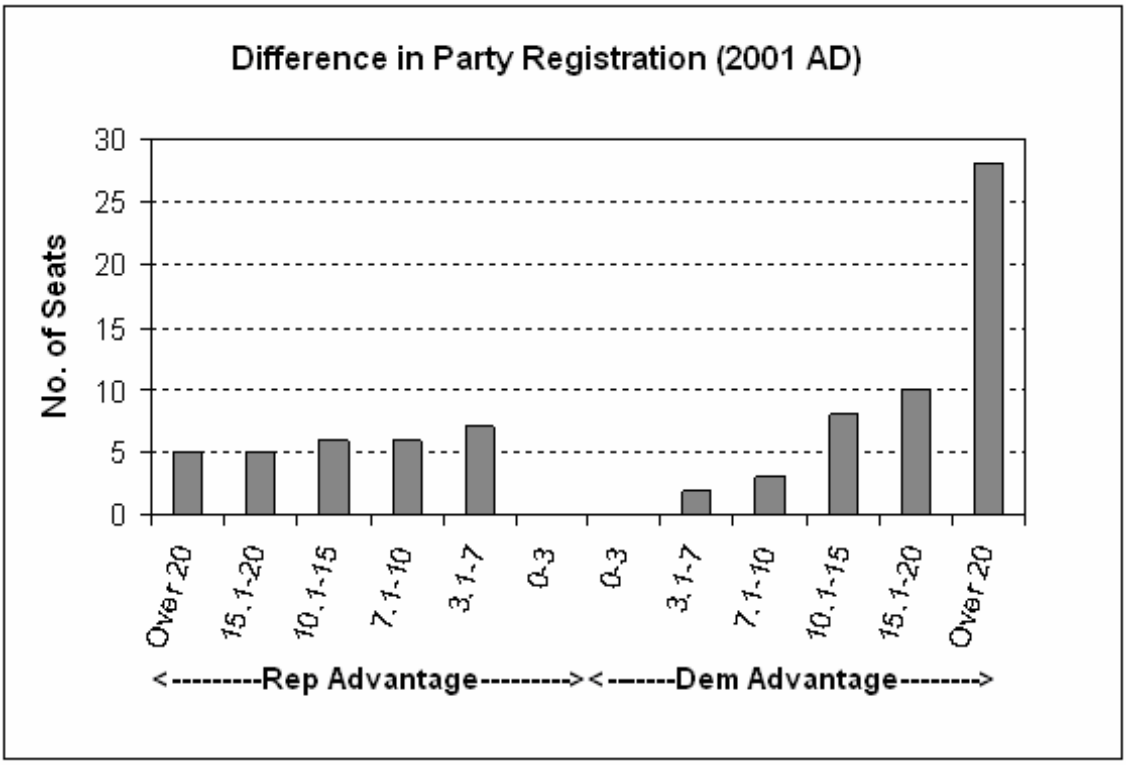
Figure 9: Fully Balanced Plans - Distribution of Average Party Difference



Adding Competition — State Assembly Level

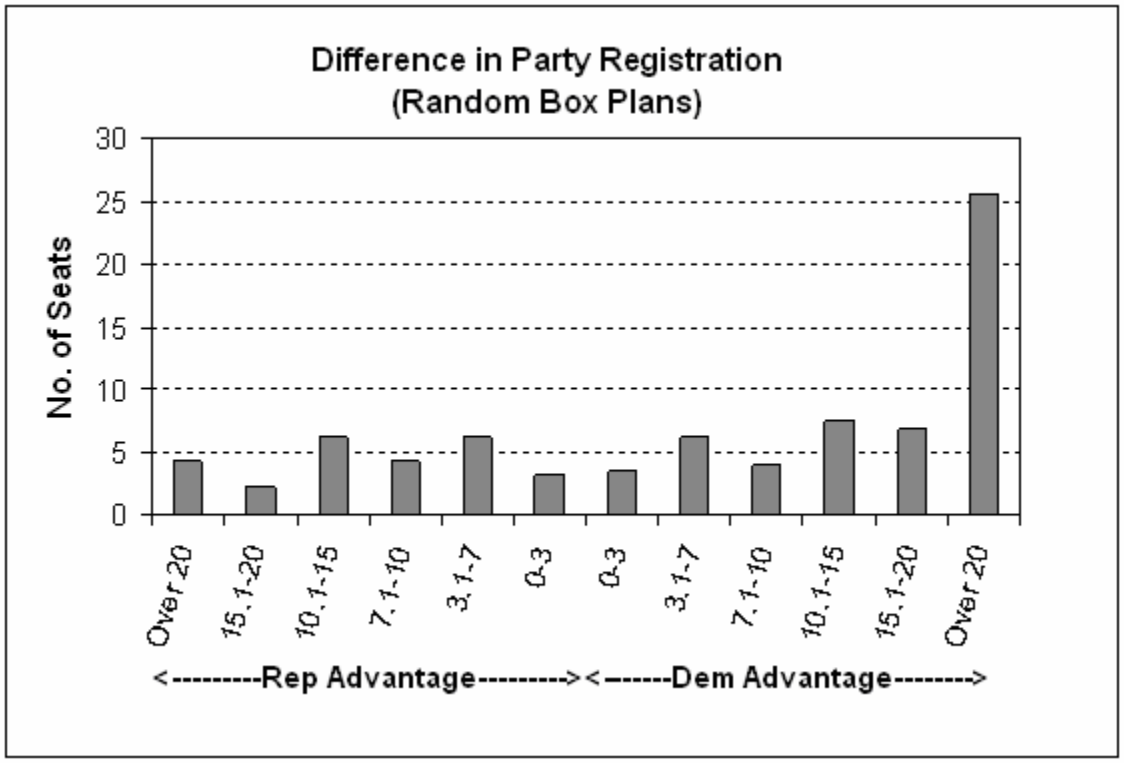
None of the Assembly districts adopted as part of the bipartisan plan of 2001 have party registration differences (based on 2000 registration figures) within 3 percentage points. However, five out of eighty seats fall in the range between 3.1 and 10 point Democratic registration advantage.

Figure 10: Existing State Assembly Districts - Distribution of Party Registration



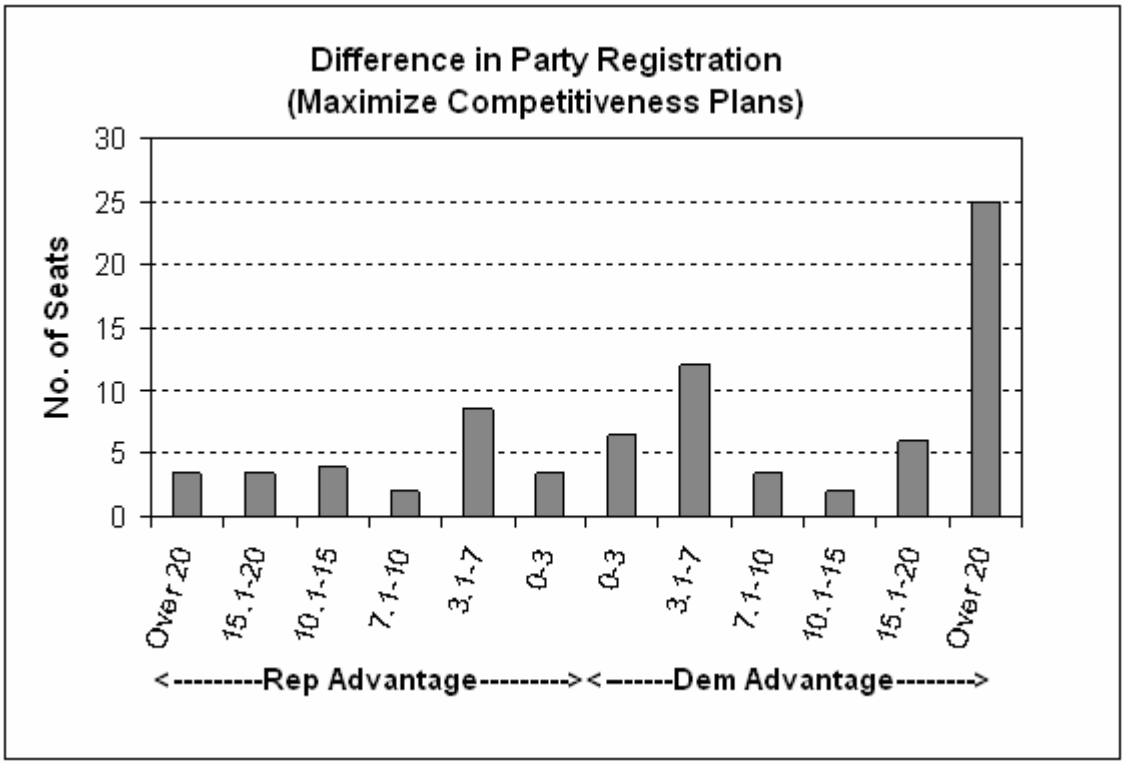
This part of our study began with the drawing of compact, equally populated districts, without the use of party registration data or consideration of other redistricting criteria. These districts were drawn without any political consideration. We produced four of these 'random box' plans. The resulting districts fared better than the 2001 bipartisan plan in terms of the number of potentially competitive seats. Figure 11 shows that, on average, 17 seats would fall into the 3 point Republican and 10 point Democratic registration range. The increase in the number of potentially competitive seats was made possible by a reduction of safe seats from both parties. Under the 2001 bipartisan plan, the Republican Party held 16 seats with at least a 10 percentage point registration advantage, and Democrats had 46. In these random box plans, the number of safe Republican and Democratic districts would be reduced to 13 and 40 respectively.

Figure 11: Random Box Plans - Distribution of Average Party Registration



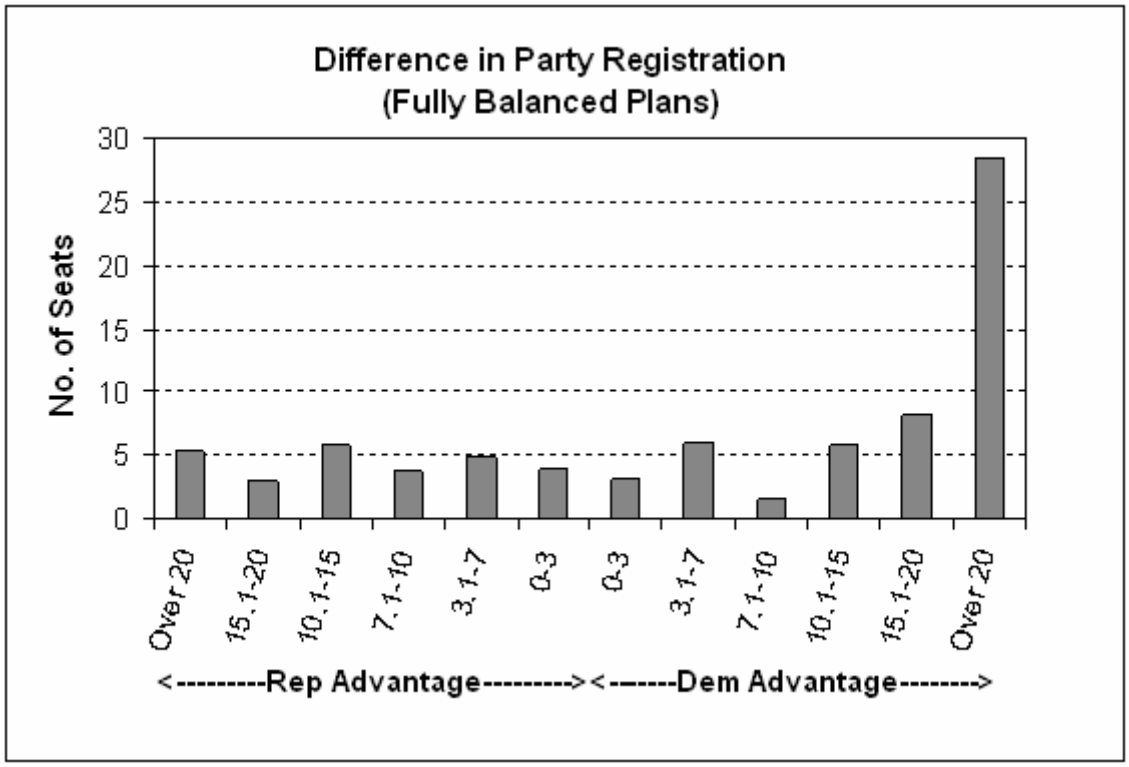
The next set of plans was produced with the single goal of maximizing the total number of potentially competitive seats. We used Census block level party registration data to locate partisan clusters. The results gave us a good estimate on the upper bound one could achieve without considering legal ramifications. In contrast to the bipartisan plan, 10 seats could be added to the missing range within a 3 point registration difference. Another 16 seats could fall between the 3.1 and 10 Democratic registration lead. In other words, 26 seats could be in the potential toss-up range which might result in party turnover.

Figure 12: Competitiveness Maximization Plans - Distribution of Average Party Registration



The last set of plans produced were the 'fully balanced' plans. Mappers first observed the Federal redistricting criteria, i.e equal population, contiguity and the Voting Rights Act. Then they attempted to draw compact and potentially competitive districts while minimizing county and city splits. Referring to figure 13, these plans on average produced 15 seats in the 3 point Republican and 10 point Democratic registration range.

Figure 13: Fully Balanced Plans - Distribution of Average Party Difference



Minority Representation and Potential Competitiveness

Majority-minority districts fulfill the descriptive representational needs of minority groups and often act as springboards for ethnic minorities to launch a political career. As most minorities tend to identify with the Democratic Party, majority minority seats are often viewed as districts without any real electoral competition. However with the changing residential patterns and partisan alignment of ethnic minorities in California, we noticed that there are areas where one might be able to draw a majority-minority district with a close party registration difference. Figure 14 shows an example in the Anaheim-Santa Ana area of Orange County. District 12 (shaded in green) has 59.5% Latinos and 1.4% African-Americans, 43% of the voters are registered Democrats and 40% are registered Republicans. Figure 15 displays another possibility in the Central Valley. District 32 is made up of the South-West part of Fresno county (primarily outside the city of Fresno), and corners of Kings and Tulare county. It has 54% Latinos with a close match of registered Democrat and Republicans (both at 43% of the registered voters). The small party registration gap might intensify electoral competition, especially in an open-seat race.

Figure 14. Potentially Competitive Majority-Minority District in Orange County

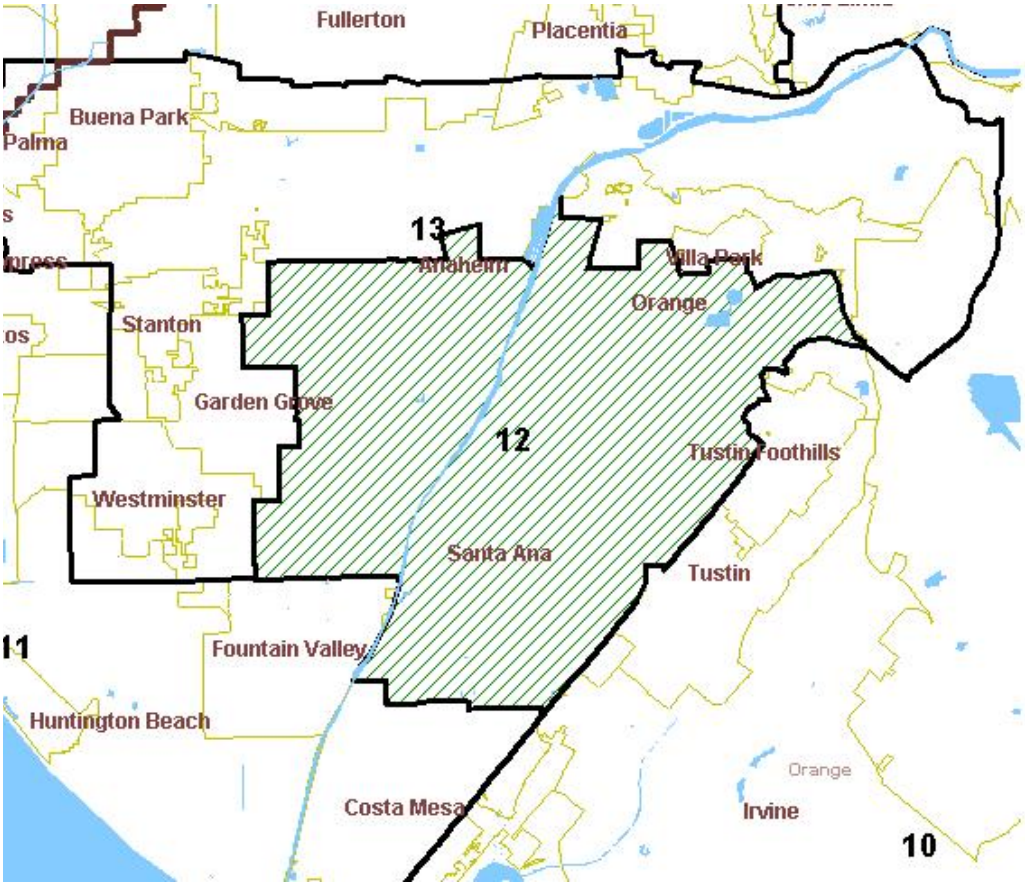
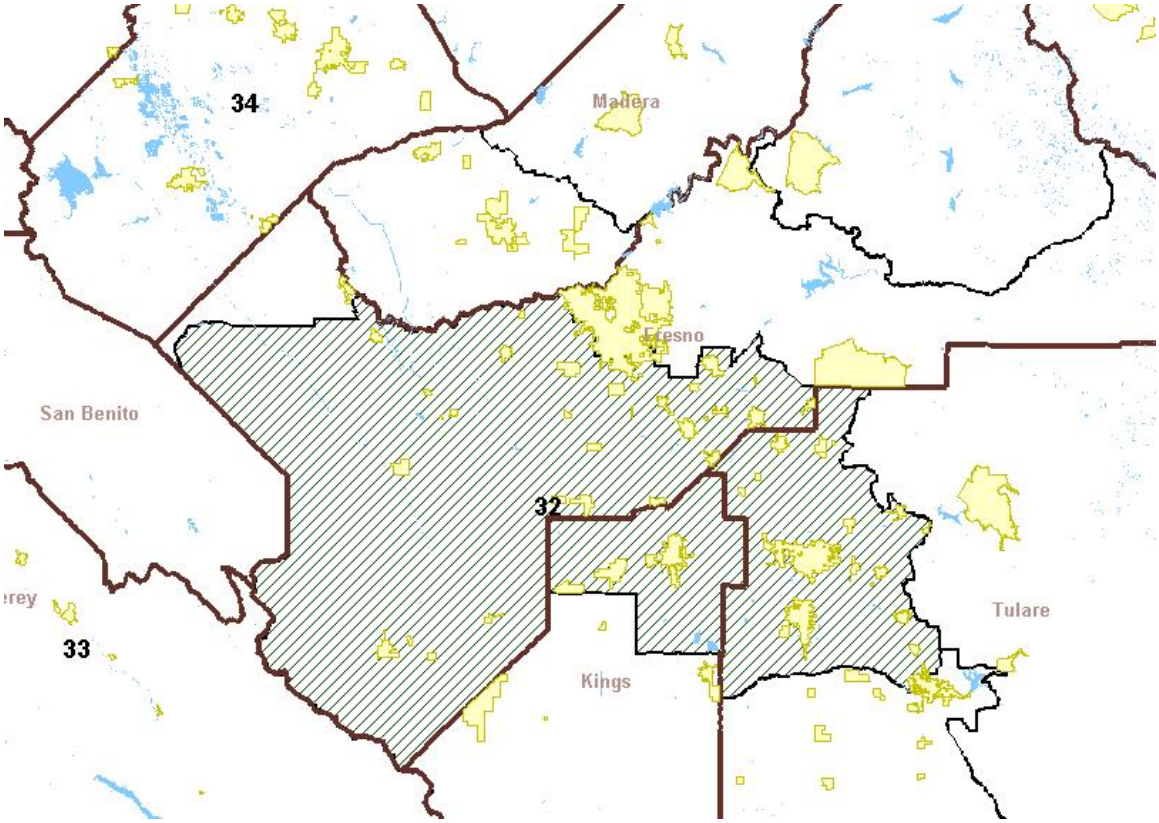


Figure 15. Potentially Competitive Majority-Minority District in the Central Valley



Trade-offs and Constraints

Like other public policy decision making processes, the redistricting process begins with a set of criteria and priorities that limit the possible outcomes. Although redistricting is becoming more complex and legal constraints since 1962 are more severe, map drawers can still navigate within the constraints and carve plans to suit their political or social agenda. In practice, redistricting negotiations often occur behind closed doors. We know that map makers consider a gamut of factors before coming up with a plan. But what precisely is the effect of each constraint on their decision making? How does the combination of different criteria affect the final outcome? What would happen if more/fewer constraints were in place? To better understand the impact of each redistricting criterion, we conducted a number of experiments in line-drawing where we relaxed some constraints and applied others, and then examined how that would affect the map one could produce.

The primary goal of these experiments is to understand the trade-offs among criteria and priorities. As discussed in the above section, the equal population requirement often results in splitting densely populated counties and cities. Because minority groups are sometimes geographically dispersed, map drawers may need to cut across counties or cities to group ethnic

communities into one district. In these cases, such districts would be less compact. Besides, the creation of majority-minority districts usually implies reduced ability to draw potentially competitive seats, perhaps with the exceptions of the Santa Ana area and the outskirts of Fresno County. In the following sections, we report how different variations of constraints affect minority representation, political subdivisions, compactness and potential competitiveness.

All plans followed the equal population and contiguity requirements. Mappers were instructed to draw districts as compact as possible. Additionally, they focused on three major redistricting constraints which were 'switched on or off' in the experiment. These three constraints were 1) fulfilling the Voting Rights Act requirements and drawing majority-minority districts; 2) preserving political subdivisions by minimizing county and city splits; 3) drawing potentially competitive districts. Our experiment began with the 'random box' plans. These random box plans consisted of drawing contiguous equal population districts using only Census demographic data (i.e. *without* any political data). These plans were the closest scenario to using a computer program to automatically draw districts. We ignored any VRA considerations, as well as city and county boundaries. Next, we added political data and attempted to draw plans that maximized a single constraint. The purpose was to estimate the 'upper bound'--- how far could we go if we concentrated our efforts on that single dimension? What is the maximum number of majority-minority or potentially competitive districts we could obtain within political/geographical limits? What is the least number of counties and Census places we need to split in order to derive equal population districts? Then our experiment increased the complexity of map making by considering two constraints at a time. Lastly, to mimic the actual redistricting process, we developed the 'fully balanced' plans which took all the criteria into consideration[8].

There are infinite ways to divide the state population into equally populated districts. The experience of our map drawers is illustrative of this point. We can not stress enough the extent of variability among those drawing lines. No two line-drawers produce the same maps. Each mapper has preconceived notions regarding what a compact district is, or which areas should be put under the same district. There is also a learning curve --- the more one maps, the easier it becomes to locate ethnic or partisan areas, or to find geographic units with a particular share of the population. In order to obtain different perspectives, we assigned at least two mappers to develop plans under each of the combination of constraints. No fewer than two plans (five for the 'fully balanced' plans) were drawn to gauge the range of possibilities.[9] The summary statistics are displayed in table 1a (for Congressional districts) and 2a (for State Assembly districts), the full results are reported in table 1b and 2b.[10] Please see Appendix II for all referenced tables.

[8] Please note that 'fully balanced' here does not mean that ALL legally required redistricting criteria were taken into consideration. 'Fully balanced' plans were only developed with the criteria used for this study, Communities of Interest, for example, were not taken into consideration.

[9] We began with Congressional districts. After developing over fifty Congressional plans, our mappers had become very proficient in identifying minority and partisan areas. Instead of having each mapper develop more than one Assembly plan under each combination of constraint, we assigned each plan to at least two mappers. Each mapper produced one plan for comparison.

[10] Table 1a and 2a display ONLY the averages from a number of plans. Readers should refer to the detail table, table 1b and 2b, to get a full range of possible values.

The first row in table 1a (highlighted in gray) lists the major statistics for the 2001 bipartisan Congressional plan which serves as a baseline for comparison. Table 1a comprises five major sections. The first section lists the constraint(s) considered. An 'X' in the column implies that the constraint was applied while an empty space indicates the constraint was relaxed. The second section shows the average number of Latino and Black seats these plans could produce. Under 'political subdivision' are figures on the number of counties and Census places split.[11] For compactness, there are many measures available. Experts in the field do not agree on one single indicator. The redistricting software used for this study, Maptitude, includes seven measures of compactness.[12] As these measures tend to agree with each other, for stylistic simplicity, we only included the mean score and standard deviation of two measures, Roeck[13] and Schwartzberg,[14] in the table.[15] Using the party registration data in 2000, the last section ('Potential Competitiveness') reports the number of potentially competitive seats where the party registration difference between the two major parties fall within 7, 5, 3 percentage points. In addition, we also count the number of seats in the 3 point Republican, 10 point Democratic 'possible toss-up' range.[16]

The random plans produced the most compact districts on average. The mean score for the Roeck measure was 0.49, highest among all the plans developed. It was significantly higher than the score for the 2001 bipartisan plan (0.33) which was generally perceived as an incumbent protection plan. However, the high compactness score we achieved with these plans did come with a cost. Without a conscious effort to boost minority representation, the number of Latinos seats fell to 7, below the existing standard of 10. As shown in figures 4 and 5, county and city boundaries never have smooth edges. Predictably, the pure pursuit of rectangular- or circular-shaped districts resulted in more counties and Census place splits. Over 200 Census places were split in this exercise, and 41 out of 58 counties were divided on average to give way to compact districts.

The next three sets of plans gave us the 'what-if' scenarios: what if we just pursue one goal single-mindedly? In terms of minority representation, we would expect an 8 seat increase in the number of districts with at least 50% Latinos (totaling 18) over the existing Congressional plan. As for potentially competitive seats, up to 20 seats could be added in the 3 point Republican, 10 point Democratic registration difference range. Not all of the seats in this potential toss-up range

[11] Here we only report the number of counties or Census places that are split/not split. More statistics (such as the number of time a district is split) are available upon request.
[12] The seven measures are Roeck, Schwartzberg, Perimeter, Polsby-Popper, Population polygon, Population Circle, Ehrenburg.
[13] It is an area-based measure that compares each district to a circle, which is considered to be the most compact shape possible. For each district, the Roeck computes the ratio of the area of the district to the area of the minimum enclosing circle for the district. The range goes from 0 (least compact) to 1 (most compact).
[14] Schwartzberg is a perimeter-based measure that compares a simplified version of each district (excluding complicated coastlines) to a circle. For each district, the test computes the perimeter ratio of the simplified version of the district to the perimeter of a circle with the same area as the original district. The district is simplified by only keeping those shape points where three or more areas in the base layer come together. Water features and a neighboring state also count as base layer areas. This simplification procedure can result in a polygon that is substantially smaller than the original district, which can yield a ratio less than 1 (e.g. an island has a 0 ratio). A score closer to 1 is more compact than a score further away from 1, i.e. a score of 0.8 is more compact than 1.5.
[15] Statistics for other measures are available upon request.
[16] Refer to the Appendix I for other measures of potential competitiveness.

would result in party turnover, but one might expect more heated electoral competition especially in open races. The current 2001 plan did a superior job in preserving county and Census place boundaries, given other redistricting constraints. Out of 58 counties and 1,081 Census places, only 22 counties and 65 Census places were divided. Our plans that attempted to minimize splits and ignored all other redistricting considerations beat the current Congressional plan by merely 2 counties and 17 Census places.

By contrasting the three sets of single constraint plans, we noticed a few intriguing results. Among these sets, plans that maximize minority representation were the least compact, with a mean Roeck score of 0.38. The reason behind this is that ethnic minorities in California have become more residentially dispersed overtime. Mappers often had to reach out far to locate pockets of ethnic communities. The implication is that if one's goal is to enhance minority representation, one would need to lower the compactness standard. Confirming this conventional belief, minority representation is often increased at the expense of electoral competitiveness. Moving from plans that maximize the number of majority-minority seat to plans that maximize competitiveness would result in a hefty reduction of Latino seats (from 18 to only 6 seats). Plans that either boost minority representation or electoral competitiveness were made possible by bisecting existing political boundaries. In a rather extreme case, boundary integrity of 40 counties and 204 Census places were sacrificed to create 20 potentially competitive seats in the 'toss-up' range.

We next enhanced the complexities by considering two constraints simultaneously along with the equal population, contiguity and compactness requirements. The additional constraint hindered one's ability to advance a single dimension. For example, in our single constraint plans, we demonstrated that it was feasible to have 18 districts with at least 50% Latinos in the population. When we attempted to preserve existing city and county boundaries, the number of Latino seats dropped to 8.[17] And when we included competitiveness, the number was reduced by 4 to 14. A similar pattern applied to competitiveness. Our single constraint plans that maximize potential competition had on average 20 seats in the likely toss-up range. Once we considered additional constraints, this number slid to 11.[18]

We developed five fully balanced plans to mimic an actual redistricting process. Although our plans were not professionally or legally polished enough to submit as real proposals, our mappers did consider all given criteria in the drawing process. As a whole, these plans on average could produce 12 Latino seats, two of these comprised at least 65% Latinos in the population. According to the 2000 Census, Asians and African Americans made up 6.7% and 10.9% of the California population respectively. However, because Asians' residential patterns are more scattered geographically, it is much harder to create majority Asian than majority Black districts. Our fully balanced plans had two districts where the percentage of African Americans exceeded 30% of the population, but only one for Asians. Compared to the 2001 bipartisan plan,

[17] Our plans did not fare as well as the 2001 Congressional plan in terms of county and Census places splits. We suspect this may due to a learning effect. It took our mappers some time to juggle multiple criteria. Perhaps if these plans were redrawn again, we might get more Latino seats with fewer county and city splits.

[18] An intriguing surprise is that the plans that maximize minority representation while minimizing city and county splits somehow ended up with more potentially competitive seats in the 3 point Republican, 10 point Democratic registration difference range. This may also be due to learning effect. If more majority-minority districts were created, the number of potentially competitive seats would decrease.

our fully balanced plans had more compact districts with far more seats in the potentially competitive range. In other words, without protecting incumbents' geopolitical interests, there was more room for improvement in both compactness and potential competitiveness. Our plans had slightly more county and city splits than the current 2001 bipartisan plan. Twenty three counties and 92 Census places were split, as compared to 22 counties and 65 Census places for the current Congressional plan. With more time and patience to fine-tune our maps, we believe it is feasible to reduce these splits without compromising competitiveness or minority representation.

Table 2a presents the summary statistics for our State Assembly plans. Again, this table averages results from several plans within each variation of constraints. (Refer to table 2b for the full range of values.) Findings for the Assembly plans parallel those for the Congressional plans. Given a single constraint, out of 80 Assembly districts, our plans produce 22 Latino seats or 26 seats in the 3 point Republican, 10 point Democratic registration difference range. Because Assembly districts have a smaller ideal population, inevitably more counties and cities must be divided to attain equal population. Our single constraint plans which attempted to minimize dividing cities and counties fared slightly better than the current bipartisan plan. We managed to split 16 fewer cities, at the expense of reducing minority representation. Dual constraints prevented mappers from blatantly overemphasizing one particular dimension. Progressively, when multiple redistricting criteria were considered at once, our fully balanced plans produced 22 Latino seats, 4 African-American seats and 3 Asian predominant districts. In regards to competitiveness, we could expect to see 15 seats in the 3 point Republican, 10 point Democratic registration range.

Discussion

The trade-offs of elevating one criterion over another, and the interplay and effects that multiple criteria have on each other and consequently on the outcome of a redistricting plan has been illustrated in the experiments above. In sum, here are some conclusions:

A strict application of the equal population criterion is the single biggest constraint on keeping cities and counties from being split. The narrower this criterion is applied, the more severe its effect will be on all other redistricting criteria, including those that we did not evaluate in this study specifically, such as preserving communities of interest within district boundaries.

California is 'covered' under Section 5 of the Voting Rights Act. This means that districts that are completely or partially part of 4 counties must be drawn such that protected minority populations are not made worse off in terms of their opportunity to elect a candidate of their own choice after the redistricting than before. Any redistricting must take these seats into consideration in order to not violate federal law. No redistricting plan can go into effect until the Department of Justice has verified that no 'retrogression' has taken place. In addition to those seats, there are additional majority minority districts that are currently in effect and that redistricters should either preserve or add to.

Voting Rights Act and majority minority districts are much more likely to be non-competitive than districts that do not preserve high concentrations of minority populations within the same district. They are also less likely to be very compact. In order to be in compliance with federal law, any redistricting in California must allow for less compact and less competitive districts in these areas. Most importantly, there is a clear inverse relationship between the number of seats that could potentially be competitive and the number of majority minority seats.

Preserving city and county lines also places a real constraint on competitiveness. California's political geography is such that Democrats predominate in many urban areas and Republicans in suburban and rural areas. When city and county boundaries are kept intact, the consequence is a baseline of non-competitiveness in most areas.

Critics of the current, legal, California plan have described its districts as 'ugly' or gerrymandered. In its most basic definition, a gerrymander is a district plan that is designed for either racial or political purposes. There is a tendency to decry every district that does not look like a box as a gerrymander. But our study shows that just because a district is non-compact does not mean it is a gerrymander. Redistricting criteria, especially the preservation of city and county boundaries, can place severe constraints on compactness because the boundaries of those jurisdictions are non-compact. Few cities in California are box-shaped. Furthermore, many cities have outlying, non contiguous areas that have to be picked up to keep the respective cities whole. Thus the canvass on which districts are constructed is already biased toward non-compactness before one line has been drawn. Counties are, generally speaking, more compact than cities, but because their populations are often larger than the districts', splitting them cannot be avoided in many circumstances and they cannot be used as building blocks as readily as cities. Minority populations in California do not always reside in compact neighborhoods. More often than not, drawing legally required majority minority seats necessitates the drawing of non compact districts.

Data Problems and Mid-Decade Redistricting

Redistricting usually begins as soon as the Bureau of the Census releases its first dataset after the Census collection. The Census is conducted every ten years and data are released for California roughly one year after the data collection. The Census Bureau releases the PL94-171 dataset, which is also known as the 'redistricting data' on the Census block level. A Census block in urban areas roughly corresponds to a city block; it is larger in rural areas. Census blocks are essentially the building blocks for electoral districts. Census blocks are the smallest geographic unit on which data are reported. They can be aggregated to Census tracts, and to most larger geographies that are essential in the redistricting process, such as cities and counties. However, due to the strict population equality requirements, especially when drawing congressional seats, the Census block as a reporting unit of data is most important.

Most states operate under fairly tight deadlines to complete redistricting. Thus, the process begins as soon as the Census data are released. The deadlines ensure that districts are drawn as close to the original date of data collection as possible, when the data are still 'fresh.' It is a commonly accepted, unavoidable fact that Census data becomes more outdated as the decade

progresses, being much more accurate closer to the collection date. Thus, the population of the electoral districts also shifts and what starts out as an apportioned plan, with districts equal in population, becomes in most cases a plan that has to be adjusted after the next Census is collected, when a new 100 percent head-count of the population is released.

The total population for California in the year 2000 as reported by the Census based on its 100 percent count of the population was 33,871,680. High mobility, developments and immigration patterns among other variables all serve to outdate these data relatively quickly. Throughout the decade, the Census Bureau and various other government agencies and departments release estimates on the growth of the population for various jurisdictions like States or Counties. There are no data sources available between Census data collections that systematically, statistically, and reliably report population figures on a small unit of analysis, such as the Census block, or even on the Census tract. Errors in population estimates vary, but they are larger on small geographic units and tend to 'wash out' on larger units like on the State or County level.

By 2005, California's Department of Finance (DOF) reported total population estimates of 36,810,358[19] an increase of 2,938,678. The DOF in the same report provides estimates on the city and county levels on how that growth is distributed. For example, the county of Riverside grew by 3.8% between 2004 and 2005 while the county of Alameda only grew by 0.7%. The smallest level estimates provided in a systematic way are by city.

If a redistricting were to begin in 2006, for instance, the first question would be: what is the ideal population for each district? Currently available Census data are outdated but estimates show that California's population has increased by about 3 million people. Depending on the data source the estimates of the population vary[20], but we do know for certain that California has grown substantially since 2000. What we do not know is the exact distribution of that growth. Without the availability of systematically collected, recent data on a small geographic unit, it would be impossible to draw equal population districts. Consider that we would not even know whether the ideal population of districts be should assessed by dividing the current total population estimate by the number of seats? Or should the 2000 Census population be used to do this? If congressional districts are held to strict scrutiny under the equal population requirement, how are line-drawers supposed to meet this criterion in the absence of current data? It seems that malapportionment would be guaranteed. Furthermore, estimates of racial and ethnic populations are known to have large error margins[21], (Black population estimates, for example, have a 10.3% error in one report) which would make the drawing of Voting Rights seats ambiguous at best.

All of this discussion leaves out the obvious point that mid-decade redistricting opens the door to political mischief. If the majority party has the ability to re-do redistricting whenever it was

[19] State of California, Department of Finance, *E-1 City /County Population Estimates, with Annual Percent Change, January 1, 2004 and 2005*. Sacramento, California, May 2005.

[20] For 2004, the Census estimates California's population at 35,893,799 (Source: U.S. Census Bureau, 2004 Population Estimates, Census 2000) while California's DOF estimates it at 36,144,000. (Source: California State Department of Finance, Demographic Research Unit, *E-1:City/County Population Estimates with Annual Percent Change* January 1, 2003 and 2004.)

[21] Current Population Survey Basic Report, March 2004 Data: California; Appendix A: Standard Errors (SE) and Confidence Intervals (CI) for Selected Measures; California State Department of Finance, Demographic Research Unit.

politically advantageous to do so, the legitimacy of California's political system would suffer. Based on the data problems and the potential for abuse, we strongly urge that any future redistricting proposal prohibit the option of mid-decade redistricting unless ordered by a court.

Who draws the lines - Mapper Effects and Time Lines

Our study did not set out to evaluate or address any potential effect it might have to move this process from a large, diverse, group of elected representatives to a small group of (most likely) homogeneous, appointed special masters. We also did not attempt to evaluate our maps qualitatively depending on how much time went into constructing them. During the five month process of conducting our experiments, we did, however, have an opportunity to observe four mappers from different backgrounds in the construction of a variety of maps.

First, it is easy to underestimate the time it takes to draw statewide plans even with the new technology. We were furthermore surprised at the variation in learning curves and how personality traits factored into how well districts were drawn. How many city and county splits a map had turned out in some cases to be a direct factor of how much time a mapper spent on that criterion and how much patience the mapper had. It also mattered whether the mapper was given a baseline of how many city/county splits the 2001 map had, and whether they were instructed to do better or not. 'Cleaning up' a map to minimize city and county splits and come up with the best possible scenario under the given criteria could add between 10 and 15 hours to a plan. The same was true when an error was found in a map that mandated a change. The process of incorporating any change in an existing plan added many hours to the final project. At times, mappers would start over from scratch, explaining that this would be faster then to incorporate a change.

When we began this study, we did not set out to measure biases that mappers might insert in the process. Our mappers spent more time mapping areas that they were familiar with than areas that they did not know. There was also a tendency to try and repeat the splitting of a district along the same line, if that line was 'in the proper location' according to that mapper. For example, one mapper has very strong feelings about where the city of Fresno should be split and 'mysteriously' her maps all split the city in the same place.

Even when our mappers did not know areas, they tended to develop biases in how districts should be built. When we tried to minimize that bias by varying the starting point of a map, i.e starting at the upper left corner and the next map with the same criterion from the lower right, they would tend to make roughly the same decisions in, for example, uniting minority populations for a VRA plan.

In sum we found that the quality of a plan very much depends on how much time is spent on constructing it. Biases are also introduced depending on who the mappers were and which areas they were familiar with. If an already existing plan receives public input and is then changed to reflect that input, it will have a ripple effect through the entire plan and add a considerable amount of time to the redrawing process.

Conclusion

In the current Congressional plan, there are no districts in the range between 3% Republican and 10% Democratic. Taking into account various constraints and trade-offs, it might be possible to get about 13 districts back into the missing range. It would be best if the decision to modify redistricting criteria and processes were made without the immediate prospect of an impending election since both parties have something to gain or lose from a new round of redistricting. Had the 2001 redistricting contained 13 seats in the potentially competitive range, it is possible that the Democrats would have lost a few seats in 2002 and 2004. A redistricting in 2006 might have cost the Republicans a few seats given prevailing national and historical trends (i.e. mid-term elections for second term Presidents). Knowledge of who wins and loses can easily undermine the search for the best process. It is better to consider procedural changes behind the "veil of ignorance," to borrow from philosopher John Rawls' phrase. Otherwise it is all about making changes for short term gain.

But it is also important to understand that redistricting is limited in its capacity to create a heavily competitive state. Even plans that ignore constitutional and good government criteria for the sake of maximizing competitiveness still leave well over half the state in safe seats. The sources of electoral safety to a greater degree lie in our choices to live with like-minded people and in socially homogenous areas. Moreover, even when districts are potentially competitive, they do not become actually competitive unless there are good candidates with well-financed campaigns. And even then, the number of seats that will turnover will likely be as low as when the court masters drew the lines in 1991 (i.e. 14 out of 260 races).

Some will say that even if turnover will never be high, competitiveness is a good in itself because it will improve the behavior of elected officials. In a future report, we will examine the widespread speculation that coming from a marginal seat creates moderation and a greater willingness to negotiate among representatives.

Based on our study, we recommend the following:

1. If language about competitiveness is included in a redistricting law, the language should only be general. Forecasting competitive seats is a tricky business and as our study indicates, the effort to maximize the number of competitive seats can wreak havoc on other criteria such as communities of interest and fairness to racial and ethnic minorities. Moreover, the definition of competitiveness will likely change over time depending upon the behavior of independents and the relative loyalty rates of partisans.

2. Given the diversity of criteria and the different perceptions that people will have about what is important in redistricting, we believe that the redistricting body should be diversely composed. Language in the proposal should urge that consideration be given to geographic, gender and racial and ethnic balance to the degree possible.

3. Communities, groups and individuals should have the right to observe the line-drawing process and to submit plans of their own. This ensures that all perspectives are put on the

table. As we noted in our study, line-drawers are inevitably influenced by their own biases and habits. Confronting the ideas of those outside the process is the best way to ensure that a broad number of options are considered.

4. The fairness of a various proposals cannot be considered without having political data and openly assessing the implications of where the lines are placed. A provision that denies the redistricting body the use of political data gives advantages to political consultants and insiders whose business is to know precinct returns and groups that have the resources to collect political data on their own. It is fairer to have this information in the public realm for all to share.

Appendix I: Measuring Potential Competitiveness

We considered three measures to assess the potential competitiveness of a district; party registration, previous statewide offices and presidential election outcomes. Party registration is the most convenient measure. Individual-level party registration files are usually available through local County Registrars. The Statewide Database, the non-partisan redistricting database for the State of California, at the Institute of Governmental Studies (UC Berkeley), provides voter registration data on the Census block level for the entire State of California. Users can load these data into their redistricting software and can immediately begin drawing. They can pre-define 'potential competitiveness;' for example, a district is deemed 'potentially competitive' if the difference in party registration between the two major parties is within 7 (or 5 or 3) percentage points.[22] Users can aggregate registration data up to the district level and calculate the percentage of registered Democrats and Republicans out of total number of registered voters. They can take the difference between the percentage of registered Democrats and Republicans and count how many districts fall into their pre-defined range. For our report, we chose the 3 point Republican, 10 point Democratic registration difference as our potentially competitive range based on our analysis of the actual races in the 1990s. For the report on Prop. 77 published by the Rose Institute in 2005, the authors extended their range to a 5 point Republican, 10 point Democratic registration advantage.[23] Tables 3a and 3b compare our indicator with the Rose Institute measure. Our fully balanced Congressional plans would on average have 13 seats in the 3 point Republican, 10 point Democratic registration range, 15 if we extended the range to 5 point Republican. As for our fully balanced Assembly plans, stretching the range would capture 17 seats instead of 15.

One caveat about using party registration data: party registration can change noticeably between years. We drew our plans using 2000 party registration data (as these were used in the 2001 round of redistricting). Except for a few outliers, almost all the Congressional plans experienced reductions in the number of potentially competitive seats. For example, for our fully balanced Congressional plans, the 2000 party registration data suggested we could expect 13 seats in the 3-10 range. Yet the number dropped to 12 if we re-analyzed these districts using 2004 party registration data.[24] This is partly due to a general realignment in partisanship in California. The coastal areas remain liberal-leaning while the inlands have turned increasingly conservative. In areas with new, rapidly growing settlements, such as the Central Valley and the Inland Empire, partisan realignment seems to tip towards the Republican Party. In other words, even if mappers

[22] Note that these cut-off points are arbitrary in nature. These party registration ranges capture seats that may have a good chance of party turnover. Actual party turnovers can and do occur outside these ranges.

[23] Johnson, Douglas, Elise Lampe, Justin Levitt, Andrew Lee. 2005. *'Restoring the Competitive Edge: California's Need for the Redistricting Reform and the Likely Impact on Proposition 77.'* The Rose Institute of State and Local Government, Claremont McKenna College.

[24] Results for Assembly plans were rather mixed. Of 21 Assembly plans, 12 experienced increases in the number of potentially competitive seats in the 3 point Republican, 10 point Democratic registration range when 2004 instead of 2000 registration data were used. Ten plans experienced a reduction. The mixed results may be explained by the fact that Assembly districts are smaller, and hence regional partisan swings can result in bigger fluctuation in party registration. More qualitative analyses may explain why some areas showed bigger partisan swings than others.

intentionally created some potentially competitive districts there, any narrow registration difference might be washed away as time goes by.

In addition to party registration, we constructed potential competitiveness measures based on previous vote outcomes. We created 'normal vote' measures by combining results for the six statewide races[25] in 1998 and 2002. As these statewide races tend to be less high-profile and voters usually vote along party lines, the purpose of this measure is to estimate the underlying partisanship of districts. By combining the 6 statewide races in two election cycles, we averaged out the quality of the candidates, the differences in money raised, and other campaign related factors. The pooled series also smoothed out fluctuations across time. Using this normal vote measure, our balanced criteria plans produced on average 11 Congressional seats or 14 Assembly seats in the margin between 3% Republican and 10% Democratic registration advantage. Comparing registration differences with a normal vote score that combined statewide races shows that registration constitutes a good part of office-holding destiny. Party registration and normal vote are highly correlated. Our fully balanced Congressional plans had 14, 11 and 7 seats within 7, 5 and 3 point registration margins. Using the normal vote measure, we got 14, 9, 7 seats respectively in the 7, 5, and 3 point range.

The third set of measures of potential competitiveness was constructed by using actual presidential election results in 2000. The 2000 presidential race between George W. Bush and Vice President Al Gore was one of the closest races in recent history. Despite the fact that party registration tends to overstate the actual vote margin, the Presidential vote in 2000 is generally close to the party registration distribution. In our balanced Congressional plan, there were 11 districts with Bush v Gore margins of 7 or less, 9 with 5 or less and 6 with 3 or less as compared to 14, 11 and 7 districts in terms of registration margins of 7, 5 and 3 points. Bush ran a little behind but voting seems to have followed party registration fairly well. We observed a similar pattern in our fully balanced Assembly plans. Based on 2000 party registration data, 18, 13 and 7 seats were in the 7, 5 and 3 registration margins, contrasted to 12, 8 and 6 seats in the 7, 5 and 3 presidential vote margins. In sum, by comparing the registration margins with the normal vote measure (i.e. the average margin of the statewide races below the Governor) and the Presidential vote in 2000, one can conclude that party registration is generally a good on-average predictor of vote margin.

[25] The six races are Lieutenant Governor, Secretary of State, Attorney General, Controller, Treasurer and Insurance Commissioner.

Table 1a. Summary Statistics for Congressional Plans

				A. Minority Representation				B. Political Subdivision				C. Compactness				D. Potential Competitiveness			
Plan Type	Draw Competitive Seat	Respect County/ City Boundary	Draw Majority-Minority Seat	No. of Seat (50%+ Hispanics)	No of Seat (65%+ Hispanics)	No. of Seat (30%+ Blacks)	No. of Seat (30%+ Asians)	No. of County Not Split	No. of County Split	No. of Census Places Not Split	No. of Census Place Split	Roeck Mean	Roeck Standard Deviation	Schwartz-berg Mean	Schwartz-berg Standard Deviation	No. of Seat (Party Registration Diff within 7 pct pt)	No. of Seat (Party Registration Diff within 5 pct pt)	No. of Seat (Party Registration Diff within 3 pct pt)	No. of Seat (Party Registration Diff 3 pt Rep, 10 pt Dem)
2001 Congressional				**10**	**4**	**2**	**0**	**36**	**22**	**1016**	**65**	**0.33**	**0.10**	**2.31**	**0.61**	**3**	**0**	**0**	**0**
Random Box				7	2	1	1	17	41	869	212	0.49	0.12	1.57	0.23	14	11	7	13
Single Constraint																			
Max MM			X	18	1	2	1	30	28	875	206	0.38	0.12	1.91	0.37	12	9	4	9
Min Split		X		7	2	1	2	38	20	1033	48	0.41	0.12	1.71	0.30	14	10	5	11
Max Competition	X			6	2	1	1	18	40	877	204	0.45	0.12	1.67	0.27	24	17	11	20
Double Constraints																			
Min Split + Max MM		X	X	8	2	1	1	34	24	912	169	0.41	0.12	1.65	0.26	15	12	7	14
Max Comp + Max MM	X		X	14	2	2	1	26	32	895	186	0.37	0.12	1.93	0.51	10	6	5	11
Max Comp + Min Split	X	X		8	3	1	1	35	23	1036	46	0.39	0.12	1.79	0.30	12	7	5	11
All Constraints																			
Fully Balanced	X	X	X	12	2	2	1	35	23	989	92	0.39	0.11	1.77	0.30	14	11	7	13

Table 2a. Summary Statistics for State Assembly Plans

				A. Minority Representation				B. Political Subdivision				C. Compactness				D. Potential Competitiveness			
Plan Type	Draw Competitive Seat	Respect County/ City Boundary	Draw Majority-Minority Seat	No. of Seat (50%+ Hispanics)	No of Seat (65%+ Hispanics)	No. of Seat (30%+ Blacks)	No. of Seat (30%+ Asians)	No. of County Not Split	No. of County Split	No. of Census Places Not Split	No. of Census Place Split	Roeck Mean	Roeck Standard Deviation	Schwartz-berg Mean	Schwartz-berg Standard Deviation	No. of Seat (Party Registration Diff within 7 pct pt)	No. of Seat (Party Registration Diff within 5 pct pt)	No. of Seat (Party Registration Diff within 3 pct pt)	No. of Seat (Party Registration Diff 3 pt Rep, 10 pt Dem)
2001 Assembly				**17**	**6**	**3**	**4**	**31**	**27**	**987**	**94**	**0.36**	**0.10**	**2.04**	**0.45**	**9**	**4**	**0**	**5**
Random Box				11	4	2	4	26	32	869	212	0.47	0.11	1.51	0.20	19	12	7	17
Single Constraint																			
Max MM			X	22	3	4	3	26	33	855	226	0.41	0.12	1.72	0.31	17	10	7	13
Min Split		X		11	5	2	3	31	27	1004	78	0.43	0.11	1.69	0.28	22	16	10	17
Max Competition	X			12	5	2	3	26	33	854	228	0.47	0.11	1.58	0.21	31	18	10	26
Double Constraints																			
Min Split + Max MM		X	X	22	4	4	4	28	31	959	122	0.40	0.11	1.80	0.31	15	10	7	17
Max Comp + Max MM	X		X	25	5	4	4	30	28	865	217	0.39	0.11	1.79	0.32	23	14	5	16
Max Comp + Min Split	X	X		11	5	2	3	28	30	1001	81	0.42	0.12	1.84	0.35	32	19	12	25
All Constraints																			
Fully Balanced	X	X	X	22	5	4	3	32	26	993	88	0.38	0.11	1.89	0.36	18	13	7	15

Notation

Max MM--Maximize number of majority-minority seat
Min Split--Minimize County/City Split
Max Comp--Maximize number of potentially competitive seat

Roeck
1=most compact
0=least compact

Schwartzberg
Closer to 1=more compact

Table 1b. Full Results for All Congressional Plans by Variation of Constraints

				A. Minority Representation				B. Political Subdivision				C. Compactness			
Plan Type	Draw Competitive Seat	Respect County/ City Boundary	Draw Majority-Minority Seat	No. of Seat (50%+ Hispanics)	No of Seat (65%+ Hispanics)	No. of Seat (30%+ Blacks)	No. of Seat (30%+ Asians)	No. of County Not Split	No. of County Split	No. of Census Places Not Split	No. of Census Place Split	Roeck Mean	Roeck Standard Deviation	Schwartz-berg Mean	Schwartz-berg Standard Deviation
2001 Congressional				**10**	**4**	**2**	**0**	**36**	**22**	**1016**	**65**	**0.33**	**0.10**	**2.31**	**0.61**
Random Box Plans															
1				5	3	1	1	17	41	889	192	0.51	0.13	1.49	0.28
2				8	1	1	1	20	38	874	207	0.47	0.12	1.52	0.19
3				7	1	1	1	23	35	892	189	0.48	0.13	1.52	0.20
4				8	2	1	2	14	44	852	229	0.49	0.11	1.65	0.23
5				9	3	1	2	13	45	838	243	0.48	0.12	1.66	0.25
			Mean	**7**	**2**	**1**	**1**	**17**	**41**	**869**	**212**	**0.49**	**0.12**	**1.57**	**0.23**
Single Constraint--Max Minority Representation															
6			X	18	1	3	1	32	26	870	211	0.39	0.11	1.79	0.28
7			X	19	1	3	1	32	26	864	217	0.40	0.11	1.80	0.30
8			X	18	2	1	2	27	31	892	189	0.36	0.13	2.13	0.54
			Mean	**18**	**1**	**2**	**1**	**30**	**28**	**875**	**206**	**0.38**	**0.12**	**1.91**	**0.37**
Single Constraint--Min County/City Split															
9		X		7	2	1	2	37	21	1036	45	0.42	0.11	1.71	0.31
10		X		6	2	0	2	39	19	1030	51	0.39	0.12	1.71	0.28
			Mean	**7**	**2**	**1**	**2**	**38**	**20**	**1033**	**48**	**0.41**	**0.12**	**1.71**	**0.30**
Single Constraint-- Max Competition															
16	X			6	1	1	1	25	33	874	207	0.42	0.13	1.67	0.28
17	X			6	2	2	2	21	37	877	204	0.40	0.13	1.75	0.29
18	X			6	2	1	1	15	43	895	186	0.48	0.10	1.63	0.22
19	X			4	2	1	1	15	43	868	213	0.47	0.13	1.64	0.27
20	X			6	2	0	1	13	45	871	210	0.47	0.13	1.66	0.27
			Mean	**6**	**2**	**1**	**1**	**18**	**40**	**877**	**204**	**0.45**	**0.12**	**1.67**	**0.27**
Dual Constraints--Min County/City Split + Max Minority Representation															
11		X	X	10	1	2	2	31	27	906	175	0.40	0.11	1.63	0.23
12		X	X	10	2	2	2	32	26	934	147	0.40	0.13	1.75	0.29
13		X	X	6	2	0	1	35	23	916	165	0.42	0.11	1.61	0.24
14		X	X	6	2	1	1	33	25	888	193	0.42	0.12	1.63	0.25
15		X	X	6	1	1	0	37	21	918	163	0.43	0.12	1.63	0.27
			Mean	**8**	**2**	**1**	**1**	**34**	**24**	**912**	**169**	**0.41**	**0.12**	**1.65**	**0.26**
Dual Constraints--Max Competition + Max Minority Representation															
21	X		X	16	1	3	1	23	35	852	229	0.38	0.13	1.97	0.40
22	X		X	16	1	3	1	23	35	900	181	0.38	0.12	1.90	0.44
23	X		X	11	4	1	1	29	29	926	155	0.36	0.11	1.96	0.57
24	X		X	12	3	2	2	28	30	903	178	0.37	0.13	1.89	0.62
			Mean	**14**	**2**	**2**	**1**	**26**	**32**	**895**	**186**	**0.37**	**0.12**	**1.93**	**0.51**
Dual Constraints--Max Competition + Min County/City Split															
25	X	X		8	3	0	1	34	24	1046	35	0.39	0.11	1.77	0.28
26	X	X		7	2	1	0	36	22	1025	56	0.39	0.12	1.80	0.32
			Mean	**8**	**3**	**1**	**1**	**35**	**23**	**1036**	**46**	**0.39**	**0.12**	**1.79**	**0.30**
Fully Balanced															
27	X	X	X	14	1	3	0	35	23	893	188	0.40	0.10	1.73	0.23
28	X	X	X	10	2	1	2	32	26	996	85	0.40	0.12	1.75	0.31
29	X	X	X	14	1	2	0	36	22	1020	61	0.39	0.11	1.86	0.29
30	X	X	X	10	2	2	1	36	22	1020	61	0.38	0.11	1.77	0.32
31	X	X	X	10	2	2	2	36	22	1016	65	0.39	0.11	1.76	0.34
			Mean	**12**	**2**	**2**	**1**	**35**	**23**	**989**	**92**	**0.39**	**0.11**	**1.77**	**0.30**

Table 2b. Full Results for All State Assembly Plans by Variation of Constraints

				A. Minority Representation				B. Political Subdivision				C. Compactness			
Plan Type	Draw Competitive Seat	Respect County/ City Boundary	Draw Majority-Minority Seat	No. of Seat (50%+ Hispanics)	No of Seat (65%+ Hispanics)	No. of Seat (30%+ Blacks)	No. of Seat (30%+ Asians)	No. of County Not Split	No. of County Split	No. of Census Places Not Split	No. of Census Place Split	Roeck Mean	Roeck Standard Deviation	Schwartz-berg Mean	Schwartz-berg Standard Deviation
2001 Assembly				**17**	**6**	**3**	**4**	**31**	**27**	**987**	**94**	**0.36**	**0.10**	**2.04**	**0.45**
Random Box Plans															
1				13	3	3	4	33	25	887	194	0.46	0.12	1.51	0.20
2				11	4	3	3	34	24	890	191	0.47	0.12	1.51	0.21
3				9	4	2	3	16	42	842	239	0.48	0.10	1.51	0.19
4				10	4	1	5	20	38	858	223	0.47	0.11	1.51	0.21
			Mean	**11**	**4**	**2**	**4**	**26**	**32**	**869**	**212**	**0.47**	**0.11**	**1.51**	**0.20**
Single Constraint--Max Minority Representation															
5			X	23	3	4	3	27	31	837	244	0.41	0.12	1.71	0.27
6			X	21	3	3	3	24	34	873	208	0.41	0.12	1.73	0.35
			Mean	**22**	**3**	**4**	**3**	**26**	**33**	**855**	**226**	**0.41**	**0.12**	**1.72**	**0.31**
Single Constraint--Min County/City Split															
7		X		12	5	2	3	35	23	1019	62	0.43	0.11	1.63	0.26
8		X		10	5	2	3	27	31	988	93	0.42	0.11	1.74	0.30
			Mean	11	5	2	3	31	27	1004	78	0.43	0.11	1.69	0.28
Single Constraint-- Max Competition															
11	X			11	4	2	2	31	27	858	223	0.47	0.11	1.57	0.20
12	X			12	5	2	3	20	38	849	232	0.46	0.11	1.58	0.21
			Mean	**12**	**5**	**2**	**3**	**26**	**33**	**854**	**228**	**0.47**	**0.11**	**1.58**	**0.21**
Dual Constraints--Min County/City Split + Max Minority Representation															
9		X	X	23	4	4	4	29	29	930	151	0.42	0.11	1.70	0.27
10		X	X	21	4	3	3	26	32	988	93	0.38	0.11	1.90	0.35
			Mean	**22**	**4**	**4**	**4**	**28**	**31**	**959**	**122**	**0.40**	**0.11**	**1.80**	**0.31**
Dual Constraints--Max Competition + Max Minority Representation															
13	X		X	25	3	4	4	31	27	862	219	0.40	0.11	1.71	0.26
14	X		X	24	6	4	3	29	29	867	214	0.38	0.11	1.87	0.38
			Mean	**25**	**5**	**4**	**4**	**30**	**28**	**865**	**217**	**0.39**	**0.11**	**1.79**	**0.32**
Dual Constraints--Max Competition + Min County/City Split															
15	X	X		11	4	1	4	32	26	992	89	0.41	0.12	1.77	0.33
16	X	X		10	5	2	2	24	34	1009	72	0.42	0.12	1.90	0.36
			Mean	**11**	**5**	**2**	**3**	**28**	**30**	**1001**	**81**	**0.42**	**0.12**	**1.84**	**0.35**
Fully Balanced															
17	X	X	X	27	4	4	2	32	26	998	83	0.39	0.12	1.82	0.29
18	X	X	X	20	5	4	4	30	28	991	90	0.38	0.11	1.91	0.42
19	X	X	X	20	6	4	3	31	27	998	83	0.38	0.11	1.95	0.36
20	X	X	X	20	6	4	4	33	25	987	94	0.37	0.12	1.89	0.34
21	X	X	X	22	6	4	3	33	25	989	92	0.38	0.11	1.90	0.43
			Mean	**22**	**5**	**4**	**3**	**32**	**26**	**993**	**88**	**0.38**	**0.11**	**1.89**	**0.37**

Table 3a. Results for Various Measures of Potential Competitiveness for All Congressional Plans

				A. 2000 Party Registration				B. 2004 Party Registration				C. Normal Vote				D. 2000 Presidential			E. Rose
Plan Type	Draw Competitive Seat	Respect County/ City Boundary	Draw Majority-Minority Seat	No. of Seat (Party Registration Diff within 7 pct pt)	No. of Seat (Party Registration Diff within 5 pct pt)	No. of Seat (Party Registration Diff within 3 pct pt)	No. of Seat (Party Registration Diff 3 pt Rep, 10 pt Dem)	No. of Seat (Party Registration Diff within 7 pct pt)	No. of Seat (Party Registration Diff within 5 pct pt)	No. of Seat (Party Registration Diff within 3 pct pt)	No. of Seat (Party Registration Diff 3 pt Rep, 10 pt Dem)	No. of Seat (Party Registration Diff within 7 pct pt)	No. of Seat (Party Registration Diff within 5 pct pt)	No. of Seat (Party Registration Diff within 3 pct pt)	No. of Seat (Party Registration Diff 3 pt Rep, 10 pt Dem)	No. of Seat (Vote Margin within 7 pct pt)	No. of Seat (Vote Margin within 5 pct pt)	No. of Seat (Vote Margin within 3 pct pt)	Rose Report Measure (5pt Rep & 10 pt Dem)
2001 Congressional Plan				**3**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**1**	**1**	**1**	**0**	**0**
Random Box Plans																			
1				12	8	8	14	16	11	8	16	17	14	8	12	14	12	8	14
2				12	9	5	13	11	7	5	11	11	8	7	12	7	5	4	15
3				15	11	5	12	16	8	7	11	12	12	5	9	11	8	4	15
4				15	11	8	14	13	8	6	12	11	10	6	9	8	8	2	15
5				18	14	7	13	12	8	7	12	14	10	6	9	13	13	7	17
			Mean	**14**	**11**	**7**	**13**	**14**	**8**	**7**	**12**	**13**	**11**	**6**	**10**	**11**	**9**	**5**	**15**
Single Constraint--Max Minority Representation																			
6			X	11	9	5	11	11	7	6	10	7	6	4	10	9	6	2	13
7			X	14	9	5	11	11	8	5	11	8	6	3	10	7	6	4	12
8			X	11	8	3	6	9	6	4	7	8	3	1	5	6	5	3	9
			Mean	**12**	**9**	**4**	**9**	**10**	**7**	**5**	**9**	**8**	**5**	**3**	**8**	**7**	**6**	**3**	**11**
Single Constraint--Min County/City Split																			
9		X		14	9	2	9	11	5	2	9	10	8	4	9	5	5	4	13
10		X		14	11	8	13	13	8	3	8	12	8	6	11	10	9	6	15
			Mean	**14**	**10**	**5**	**11**	**12**	**7**	**3**	**9**	**11**	**8**	**5**	**10**	**8**	**7**	**5**	**14**
Single Constraint-- Max Competition																			
16	X			25	18	13	20	20	15	9	13	17	13	9	14	17	13	12	22
17	X			29	18	14	25	23	17	10	17	20	14	8	13	16	13	8	26
18	X			21	14	8	18	20	12	8	14	17	14	8	12	13	10	8	20
19	X			23	16	10	18	21	16	9	12	16	12	8	13	16	8	4	22
20	X			24	17	10	19	19	15	11	14	17	13	10	14	15	9	1	22
			Mean	**24**	**17**	**11**	**20**	**21**	**15**	**9**	**14**	**17**	**13**	**9**	**13**	**15**	**11**	**7**	**22**
Dual Constraints--Min County/City Split + Max Minority Representation																			
11		X	X	16	12	5	14	15	10	6	12	13	11	7	11	12	8	6	15
12		X	X	15	10	7	12	12	9	5	9	12	9	6	9	9	8	6	13
13		X	X	12	9	7	14	13	10	9	13	12	10	5	11	8	3	2	14
14		X	X	15	13	8	16	14	11	8	14	15	11	5	12	8	7	6	19
15		X	X	15	14	9	16	15	11	8	14	15	12	7	14	10	6	5	18
			Mean	**15**	**12**	**7**	**14**	**14**	**10**	**7**	**12**	**13**	**11**	**6**	**11**	**9**	**6**	**5**	**16**
Dual Constraints--Max Competition + Max Minority Representation																			
21	X		X	10	6	5	10	9	5	3	7	9	3	2	11	7	6	3	10
22	X		X	8	5	5	11	10	6	4	10	10	8	5	12	12	10	8	11
23	X		X	12	7	5	12	10	8	6	13	8	7	5	8	8	7	4	12
24	X		X	11	6	5	11	10	8	6	11	10	9	4	11	10	6	3	11
			Mean	**10**	**6**	**5**	**11**	**10**	**7**	**5**	**10**	**9**	**7**	**4**	**11**	**9**	**7**	**5**	**11**
Dual Constraints--Max Competition + Min County/City Split																			
25	X	X		9	5	3	7	8	5	3	6	8	6	2	7	7	5	4	7
26	X	X		15	8	6	14	13	8	6	12	12	7	5	14	7	6	4	15
			Mean	**12**	**7**	**5**	**11**	**11**	**7**	**5**	**9**	**10**	**7**	**4**	**11**	**7**	**6**	**4**	**11**
Fully Balanced																			
27	X	X	X	16	11	7	14	14	13	10	13	13	9	8	11	11	9	6	17
28	X	X	X	14	10	6	12	15	10	5	12	14	9	5	10	12	11	10	14
29	X	X	X	16	12	7	13	14	14	10	14	13	9	8	11	11	9	5	16
30	X	X	X	10	9	7	12	11	8	5	11	13	7	6	11	7	6	3	13
31	X	X	X	16	11	7	12	13	12	7	11	15	11	7	11	12	8	7	14
			Mean	**14**	**11**	**7**	**13**	**13**	**11**	**7**	**12**	**14**	**9**	**7**	**11**	**11**	**9**	**6**	**15**

Table 3b. Results for Various Measures of Potential Competitiveness for All State Assembly Plans

				A. 2000 Party Registration				B. 2004 Party Registration				C. Normal Vote				D. 2000 Presidential			E. Rose
Plan Type	Draw Competitive Seat	Respect County/ City Boundary	Draw Majority-Minority Seat	No. of Seat (Party Registration Diff within 7 pct pt)	No. of Seat (Party Registration Diff within 5 pct pt)	No. of Seat (Party Registration Diff within 3 pct pt)	No. of Seat (Party Registration Diff 3 pt Rep, 10 pt Dem)	No. of Seat (Party Registration Diff within 7 pct pt)	No. of Seat (Party Registration Diff within 5 pct pt)	No. of Seat (Party Registration Diff within 3 pct pt)	No. of Seat (Party Registration Diff 3 pt Rep, 10 pt Dem)	No. of Seat (Party Registration Diff within 7 pct pt)	No. of Seat (Party Registration Diff within 5 pct pt)	No. of Seat (Party Registration Diff within 3 pct pt)	No. of Seat (Party Registration Diff 3 pt Rep, 10 pt Dem)	No. of Seat (Vote Margin within 7 pct pt)	No. of Seat (Vote Margin within 5 pct pt)	No. of Seat (Vote Margin within 3 pct pt)	Rose Report Measure (5pt Rep & 10 pt Dem)
2001 Assembly Plan				**9**	**4**	**0**	**5**	**7**	**2**	**1**	**8**	**6**	**4**	**0**	**6**	**5**	**1**	**1**	**8**
Random Box Plans																			
1				18	11	5	15	16	12	5	17	17	12	8	18	14	11	7	20
2				23	15	9	25	22	20	12	24	24	18	13	19	20	14	6	26
3				22	13	9	15	17	13	9	16	20	14	10	19	17	12	9	18
4				14	8	4	13	14	11	9	16	16	13	7	14	17	10	8	15
			Mean	**19**	**12**	**7**	**17**	**17**	**14**	**9**	**18**	**19**	**14**	**10**	**18**	**17**	**12**	**8**	**20**
Single Constraint--Max Minority Representation																			
5			X	20	10	9	15	15	10	5	16	18	8	4	15	12	8	6	16
6			X	14	10	5	11	13	10	7	13	12	7	4	11	11	9	6	14
			Mean	**17**	**10**	**7**	**13**	**14**	**10**	**6**	**15**	**15**	**8**	**4**	**13**	**12**	**9**	**6**	**15**
Single Constraint--Min County/City Split																			
7		X		20	16	9	17	17	15	10	18	17	13	8	18	14	10	6	23
8		X		24	16	11	16	20	16	10	16	17	14	8	15	18	16	7	20
			Mean	**22**	**16**	**10**	**17**	**19**	**16**	**10**	**17**	**17**	**14**	**8**	**17**	**16**	**13**	**7**	**22**
Single Constraint-- Max Competition																			
11	X			32	19	12	30	26	23	11	20	22	18	12	19	17	14	10	32
12	X			29	17	8	21	22	15	10	18	19	14	9	16	14	9	4	26
			Mean	**31**	**18**	**10**	**26**	**24**	**19**	**11**	**19**	**21**	**16**	**11**	**18**	**16**	**12**	**7**	**29**
Dual Constraints--Min County/City Split + Max Minority Representation																			
9		X	X	12	8	5	16	15	9	5	16	18	10	4	14	11	8	8	18
10		X	X	18	12	9	17	15	12	10	16	14	9	6	13	10	4	3	19
			Mean	**15**	**10**	**7**	**17**	**15**	**11**	**8**	**16**	**16**	**10**	**5**	**14**	**11**	**6**	**6**	**19**
Dual Constraints--Max Competition + Max Minority Representation																			
13	X		X	25	15	5	19	20	15	8	21	19	11	7	19	16	13	7	22
14	X		X	21	12	4	13	18	12	4	16	12	10	5	14	9	5	1	15
			Mean	**23**	**14**	**5**	**16**	**19**	**14**	**6**	**19**	**16**	**11**	**6**	**17**	**13**	**9**	**4**	**19**
Dual Constraints--Max Competition + Min County/City Split																			
15	X	X		33	19	12	25	27	17	14	21	27	18	10	17	21	16	11	29
16	X	X		31	19	11	24	24	16	9	20	24	21	12	17	21	15	10	26
			Mean	**32**	**19**	**12**	**25**	**26**	**17**	**12**	**21**	**26**	**20**	**11**	**17**	**21**	**16**	**11**	**28**
Fully Balanced																			
17	X	X	X	16	12	8	12	17	14	9	15	18	12	6	12	15	11	6	13
18	X	X	X	18	14	7	15	15	13	7	16	12	10	6	16	11	7	7	17
19	X	X	X	18	12	8	17	18	10	7	18	16	11	7	14	11	7	2	18
20	X	X	X	20	13	7	16	17	12	8	18	17	13	7	16	12	9	6	19
21	X	X	X	18	13	6	14	16	10	6	14	14	11	6	13	10	8	7	16
			Mean	**18**	**13**	**7**	**15**	**17**	**12**	**7**	**16**	**15**	**11**	**6**	**14**	**12**	**8**	**6**	**17**