Redistricting Principles for the Twenty-First Century

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REDISTRICTING PRINCIPLES FOR THE TWENTY-FIRST CENTURY

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ABSTRACT

Baker v. Carr's *elevation of new population equality criteria for redistricting over old geographic-based criteria reflected an evolution in how the courts and society understood the principles of representation. Twenty-first century principles of redistricting should reflect modern understandings of representation and good government—and also reflect the new opportunities and constraints made possible through advancing technology and data collection.*

INTRODUCTION

The landmark 1962 United States Supreme Court decision *Baker v. Carr*[1] profoundly affected redistricting practices. Prior to the decision, the federal government imposed limited regulations on congressional districting that were weakly enforced. Congressional and state legislative redistricting rules and procedures were to be found primarily in state constitutions and statutes that were similarly rarely enforced. By declaring redistricting to be justiciable, the Court laid down a marker in *Baker* that federal constitutional and statutory criteria would be enforced upon the states. A flurry of redistricting activity commenced following subsequent decisions in *Wesberry v.*

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[1] 369 U.S. 186 (1962).

Sanders[2] and in *Reynolds v. Sims*[3] finding that the Fourteenth Amendment requires districts to be of equal population. The federal courts overturned many state redistricting provisions in whole, particularly when sections that favored minimum allocation of seats to local government administrative units would result in impermissibly large population deviations among districts.

At the time, observers cheered these decisions, believing that disarming the gerrymandering demon's tool of malapportionment—unequal district populations—would significantly constrain redistricting mischief. However, politicians reacted to the subordinance of traditional redistricting principles to population equality by using population equality as justification to draw non-compact districts that split existing political boundaries. The intent behind these oddly shaped districts was often to favor or disfavor a political party, minority community, or incumbent by finely slicing communities, and even isolate prospective candidates' homes, using district lines. The gerrymander evolved and continued to thrive in its new legal environment.

In the decades following *Baker*, reformers have struggled to forge new links to chain the dreaded gerrymander—and have had some notable successes such as the federal Voting Rights Act and the adoption of citizen redistricting commissions by ballot initiative in states such as Arizona and California. This Article's purpose is to categorize these efforts to regulate redistricting and to identify new opportunities made possible by emerging technological innovations. By doing so, we hope to illuminate potentially viable heretofore unexplored reform pathways enabled by technological innovations.

I. REDISTRICTING PRINCIPLES PRIOR TO *BAKER V. CARR*

Early U.S. districting was based on principles of representation found primarily in state constitutions that recognized both individual interests and territorially organized (although not necessarily contiguous) communities. The primary operational constraints were the regularity of redistricting to equalize populations, and the integrity of administrative units, most often counties. Contiguity was a common, but secondary constraint. Often, districting was synonymous with the practice of applying a population formula to allocate a number of legislative seats to administrative units such as counties or towns, a process known as apportionment.

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[2] 376 U.S. 1 (1964).
[3] 377 U.S. 533 (1964).

The U.S. Constitution is silent on the use of districts as a means to select members to Congress, much less on the use and manner of redistricting. Article I, section 2 of the U.S. Constitution describes a method of apportionment of congressional seats to the states following the decennial census.[4] And, until the 28th Congress, 20 to 44 percent of representatives were not elected from single-member districts.[5]

Using the authority granted under Article I, section 4, Congress mandated the use of single member districts in 1842.[6] Notwithstanding the prohibition on multi-member congressional districts, representatives continued to be elected from multi-member/at-large districts in every subsequent decade before *Baker*. And, prior to the equal population standard articulated in the litigation subsequent to *Baker*, states would only be required to change their congressional districts in the event that apportionment resulted in a loss of a seat to Congress. Even then, political circumstances sometimes prevented a state from implementing a new districting

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[4]   Article I, section 2 states that "[t]he Number of Representatives shall not exceed one for every thirty Thousand, but each State shall have at Least one Representative." U.S. Const. art. I, § 2. This was later amended in section 2 of the Fourteenth Amendment, which provides that "Representatives shall be apportioned among the several States according to their respective numbers, counting the whole number of persons in each State, excluding Indians not taxed." *Id.* at amend. XIV, § 2. The number of seats gradually increased over time as the county's population grew. In 1911, the number of representatives was set at 433, plus two more seats allocated for Arizona and New Mexico when they achieved statehood. Act of Aug. 3, 1911, ch. 5, 37 Stat. 13, 14. Congress failed to enact an apportionment for the 1920 census, and in 1929, a compromise was reached that permanently fixed the number at 435. Reapportionment Act of June 18, 1929, ch. 28, 46 Stat. 21, 26, 27. Temporary increases were permitted in 1960 for Alaska and Hawaii statehood. Alaska Statehood Act, Pub. L. No. 85–508, § 9, 72 Stat. 339, 345 (1958); Hawaii Statehood Act, Pub. L. No. 86–3, § 8, 73 Stat. 4, 8 (1959).

[5]   Micah Altman, *Traditional Districting Principles: Judicial Myths vs. Reality*, 22 SOC. SCI. HIST. 159, 171 tbl.5 (1998).

[6]   Act of June 25, 1842, ch. 47, § 2, 5 Stat. 491; *see* Wesberry v. Sanders, 376 U.S. 1, 8 n.11 (1964) ("As late as 1842, seven States still conducted congressional elections at large."). The requirement was omitted in 1850, Act of May 23, 1850, ch. 11, § 25, 9 Stat. 428, 432–33, but reinstated in 1862, Act of July 14, 1862, ch. 170, 12 Stat. 572. The requirement was omitted in the Reapportionment Act of June 18, 1929, ch. 28, § 22, 46 Stat. 21, 26–27; *see also,* Wood v. Broom, 287 U.S. 1, 7–8 (1932) (discussing the legislative history of the 1929 Act and determining that the omission was deliberate). Congress reinstated the requirement in 1967, Act of Dec. 14, 1967, Pub. L. No. 90–196, 81 Stat. 581 (codified at 2 U.S.C. § 2c (2006)); *see generally* Colegrove v. Green, 328 U.S. 549, 555–56 (1946) (discussing the history of congressional redistricting legislation). Although it is contemplated in 2 U.S.C. § 2a(c) that at-large elections may be used to elect members of Congress if a state fails to conduct a redistricting, 2 U.S.C. § 2c requires that "only" single-member districts shall be used, which was given precedence over 2 U.S.C. § 2a(c) in *Branch v. Smith*, 538 U.S. 254 (2003), except when "on the eve of a congressional election, no constitutional redistricting plan exists and there is no time for either the State's legislature or the courts to develop one." *Id.* at 275 (opinion of Scalia, J.).

plan, and attempts to enforce the law in the courts generally met with failure.[7]

Through statute, the federal government prior to *Baker* also imposed some criteria on how the districts were to be drawn. The 1872 Act required that congressional districts have "practicable" population equality, and the 1901 Act added a general compactness requirement.[8] However, the 1929 apportionment compromise did not reinstate any of the past Acts' requirements for contiguity, equal-population, compactness, or single-member districts.[9]

In the federal system, states are tasked with drawing districts. State constitutions often describe a mechanism for apportionment or redistricting their state legislatures, since that function is a part of organizing state government. However, with two exceptions—California's county integrity requirement and West Virginia's requirement for contiguity and compactness[10]—prior to *Baker* they were silent on congressional redistricting, perhaps because the federal government had primary oversight of congressional elections through Article I, section 4 of the U.S. Constitution.[11]

All states use a district-based system to elect state legislatures. Today, all states award a seat to the candidate that receives a plurality of the vote in an election.[12] While most states use single-member districts, some elect multiple candidates from the same district, and some states have implemented what are known as floterial districts, where districts for the same legislative body may overlap.[13] In states

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[7] *See, e.g.*, Colegrove v. Green, 328 U.S. at 552 (refusing to intervene in a redistricting controversy in Illinois "because due regard for the effective working of our Government revealed this issue to be of a peculiarly political nature and therefore not meet for judicial determination").

[8] *See* Altman, *supra* note 5, at 167 (summarizing chapter nine of LAURENCE F. SCHMECKEBIER, CONGRESSIONAL APPORTIONMENT 127–92 (1941)).

[9] It was unclear whether these requirements were in effect until the Court ruled that the Acts applied only to the apportionment for which they were written. *See* Wood v. Broom, 287 U.S. at 6 (interpreting the provisions of each reapportionment act to apply "to the election of representatives 'under this apportionment,' that is, the apportionment made by the particular act").

[10] Altman, *supra* note 5, at 168 tbl. 3.

[11] For a review of the current laws see Michael P. McDonald, *A Comparative Analysis of U.S. State Redistricting Institutions*, 4 ST. POL. & POL'Y Q. 371 (2004); JUSTIN LEVITT, BRENNAN CTR. FOR JUSTICE, A CITIZEN'S GUIDE TO REDISTRICTING (2010), *available at* http://www.brennancenter.org/content/resource/a_citizens_guide_to_redistricting_2010_edition.

[12] *See* James L. McDowell, *Illinois*, *in* REAPPORTIONMENT POLITICS, THE HISTORY OF REDISTRICTING IN THE 50 STATES 101, 108 (Leroy Hardy et al. eds., 1981) (describing how Illinois was the last state to employ a form of proportional representation for the state House, a system that was replaced with plurality-win elections in 1980).

[13] New Hampshire is the only state that currently uses floterial districts for state legislatures. *See* Boyer v. Gardner, 540 F. Supp. 624, 626 (D.N.H. 1982) (upholding the state's use of floterial districts). Floterial districts were used for congressional elections when a state would gain a district through apportionment, fail to redistrict, and elect the addition seats

that use multi-member districts, voters are typically given a number of votes equal to the number of seats and may vote for one or more candidates. Candidates are rank-ordered by the votes they receive and the top candidates for a given number of seats to be elected are declared winners. All states must redistrict their legislative districts, with the exception that no redistricting is required if a state is allocated a single congressional district.

The state constitutional and statutory mechanisms by which redistricting for both congressional and state legislative redistricting occurs are varied as to the process, timing of redistricting, and criteria to be applied.[14] And unlike the federal courts, prior to *Baker v. Carr*, state courts occasionally weighed-in on state constitutional issues. For example, state courts adjudicated alleged state constitutional violations in California, Illinois, Michigan, New York, North Carolina, and Wisconsin.[15] But, even for states with state constitutional provisions guiding state legislative redistricting, deference by the state courts to the political process was historically the norm.

Altman lists the formal criteria for legislative redistricting in each state and the time of their adoption.[16] To summarize, states were split on the primary method of apportionment—while some states based apportionment of state legislatures' seats on population, others explicitly apportioned by counties, cities or other pre-existing geographical and political units. Even in states where apportionment was based on population, many states required that districts respect county lines. A substantial minority of states also required contiguity, and only seven required compactness.

An empirical analysis of historical congressional districts reveals a somewhat different picture:[17] Even in the absence of formal requirements, the vast majority of congressional districts followed county (or, more rarely, town and city) boundaries, at least up to the time of the 48th Congress in 1883.[18] With the exception of districts

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through overlapping at-large districts. 2 U.S.C. § 2a (2006).

[14] For a survey of timing derived from state constitutions, state statutes, and state court opinions, see Justin Levitt & Michael P. McDonald, *Taking the "Re" out of Redistricting: State Constitutional Provisions on Redistricting Timing*, 95 GEO. L.J. 1247, 1254–66 (2007).

[15] Levitt & McDonald, *supra* note 14, at 1255.

[16] Altman, *supra* note 5, at 169–70.

[17] *See id.* at 180–85 (finding that historically "very few districts divided town and county boundaries"); *see also* KENNETH C. MARTIS, THE HISTORICAL ATLAS OF UNITED STATES CONGRESSIONAL DISTRICTS, 1789–1983 (1982) (showing historical rural congressional districts tended to be composed of whole counties).

[18] Altman, *supra* note 5, at 181 tbl. 7.

spanning large bodies of water, violations of contiguity were quite rare during this time.[19] Historical congressional districts were also compact (by common quantitative measures) compared to modern, post-*Baker* districts.[20]

Congressional districts were also routinely malapportioned, even after the passage of the 1842 Reapportionment Act. In the most malapportioned states, population varied by a ratio of 9.5 to 1 prior to the Act (during the 18th Congress), although the average degree of malapportionment was substantially lower.[21]

In large part, both the relative compactness of the districts and their relative malapportionment were a result of the formal and informal emphasis on counties as a unit of representation. Counties were often themselves relatively compact, but varied greatly in population. The widespread practice of forming districts from contiguous counties limited the potential for districts to be non-compact, while constraining the possibility for population equality.

The stability of district boundaries also contributed to malapportionment. In practice, a state was forced to change its district lines only when a state's seat allocation changed. And, even in this case, the required changes were more limited than after *Baker*: the addition of a seat might be addressed by adding an at-large district, while the subtraction of a seat could be addressed only by modifying a few districts.

II. THE REAPPORTIONMENT REVOLUTION

Baker was not the first acknowledgement by the Court that the right to vote went beyond the simple right to cast a ballot and to have that ballot counted. Two years earlier, in *Gomillion v. Lightfoot*,[22] the Court recognized the principle that voters could be harmed by reducing the effectiveness of their vote. In *Gomillion,* Black petitioners asserted that the city of Tuskegee had gerrymandered its boundaries to remove all black resident voters, thereby eliminating any meaningful black participation in city elections. The Court agreed.

Justice Frankfurter, delivering the opinion of the Court, framed the issue as a deprivation of the right of blacks to vote, as guaranteed by the Fifteenth Amendment.[23] But the facts of the case were that no

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[19] *Id.* at 180–81.
[20] *Id.* at 181–85.
[21] *Id.* at 177 fig. 5.
[22] 364 U.S. 339 (1960).
[23] *Id.* at 340–48.

petitioner was individually denied the right to vote, nor were such votes literally discarded. Instead the voting power of blacks was effectively reduced by removing them from an important political unit. *Gomillion's* operating principle seems to have been not an abstract racial classification but the denial of the *effective* right to vote.

Following *Baker*, the Supreme Court's two landmark 1964 decisions *Reynolds v. Sims*[24] and *Wesberry v. Sanders*[25] imposed federal operational constraints of equal population and emphasized principles of equal protection. At the time, observers cheered these decisions. They believed that disarming the gerrymandering demon's tool of malapportionment—unequal district populations—would significantly constrain redistricting mischief.[26] To be sure, malapportionment had been a powerful tool to favor rural political interests by diminishing the effective voting power of urban dwellers living in fast growing cities.[27] As Gelman and King note, however, "population equality guarantees almost no form of fairness beyond numerical equality of population."[28] Indeed, politicians reacted to the subordinance of traditional redistricting principles to population equality by using population equality as justification to draw non-compact districts that split existing political boundaries.[29] A motivation underlying these oddly shaped districts was often to favor or disfavor a political party, minority community, or incumbent by finely slicing communities, and even prospective candidates' homes, with district lines. The partisan gerrymander evolved and continued to thrive in its new legal environment.

A flurry of litigation in the wake of these 1964 decisions struck down many state constitutional practices, particularly apportionment procedures that allocated seats to counties or towns. Simple allocation rules guaranteeing a minimum number of seats to governmental units

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[24] 337 U.S. 533 (1964).

[25] 376 U.S. 1 (1964).

[26] *See* John P. White & Norman C. Thomas, *Urban and Rural Representation and State Legislative Apportionment*, 17 W. POL. Q. 724, 741 (1964) ("Feelings of apathy and hopelessness about [malapportionment] have given way to a rather manic euphoria since the *Baker* and *Reynolds* decisions.").

[27] *See, e.g.*, Stephen Ansolabehere, Alan Gerber & James Snyder, *Equal Votes, Equal Money: Court-Ordered Redistricting and Public Expenditures in the American States*, 96 AM. POL. SCI. REV. 767, 768 (2002) (finding the reapportionment revolution shifted allocation of federal money from rural areas to urban areas).

[28] Andrew Gelman & Gary King, *Enhancing Democracy through Legislative Redistricting*, 88 AM. POL. SCI. REV. 541, 553 (1994).

[29] *See* Richard G. Niemi & Laura R. Winsky, *The Persistence of Partisan Redistricting Effects in Congressional Elections in the 1970s and 1980s*, 54 J. POL. 565, 566 (1992) ("[T]here has been speculation that partisan gerrymandering only began to flower in the 1980s, as legislators learned how to take maximum advantage of the equal population requirement .").

would result in impermissibly large population deviations among districts according to the Court's new interpretation of the federal constitution. States revised their constitutions, often through state constitutional conventions.

Empirically, a clear result of *Baker* was to reduce malapportionment at the cost of the main traditional redistricting criterion pre-*Baker*, county integrity. After the equal population criterion was introduced, the number of districts following county boundaries dropped dramatically, as did average geographic compactness of districts. Simultaneously, the number of districts that were not contiguous or that maintained contiguity through questionable measures, such as connection at a single point, increased dramatically. Similar changes occurred after *Karcher v. Daggett*,[30] which imposed near-absolute population equality requirements.[31]

In some cases, states created redistricting commissions, either as a sole redistricting authority or as a backup to the regular legislative process.[32] Some commentators believe that all redistricting commissions are "independent" from politics,[33] and some redistricting commissions in other countries are relatively independent.[34] A more pragmatic examination of redistricting commissions in the United States, however, and particularly these early ones, reveals that these commissions were more often designed to concentrate political power in party leaders, rather than to remove politics from the process. Among the most telling examples are those in which elected officials serve as commissioners.[35] After *Baker,* the federal courts served as a

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[30] 462 U.S. 725 (1983).

[31] *See* Altman, *supra* note 5, at 180–86 (attributing a decrease in compactness of districts after *Karcher v. Daggett* to the necessity of meeting the strict requirements, "which is not to say that some gerrymanderers did not make a virtue of necessity").

[32] *See* Levitt & McDonald, *supra* note 14, at 1255 n.36 (listing states that revisited district population requirements); McDonald, *supra* note 11, at 381 tbl.2 (listing states that amended their redistricting processes in the 1960s through the early 1970s: Colorado, Hawaii, Illinois, Indiana, Iowa, Maine, Mississippi, Missouri (state House only), Montana, New Jersey, Oklahoma, and Pennsylvania). Some states enacted reforms preceding the 1960s. Ohio instituted the first U.S. redistricting commission as sole redistricting authority in 1851 and Texas pioneered the commission as a backup to a failure of the legislative process in 1948. *Id.* These states share a common principle with the states that later amended their constitutions: Ohio and Texas sought to ensure that districts were regularly drawn in a timely manner in order to manage their states' population growth. Kathleen L. Barber, *Ohio*, *in* REAPPORTIONMENT POLITICS, *supra* note 12, at 256–57; Ronald G. Claunch, Wesley S. Chumlea & James G. Dickson, Jr., *Texas*, *in* REAPPORTIONMENT POLITICS, *supra* note 12, at 311.

[33] Alan Abramowitz, Brad Alexander, & Matthew Gunning, *Don't Blame Redistricting for Uncompetitive Elections*, 39 PS: POL. SCI. & POL. 87, 87–89 (2006).

[34] *See* Micah Altman & Michael P. McDonald, *Technology for Public Participation in Redistricting*, *in* REDISTRICTING AND REAPPORTIONMENT IN THE WEST 247–71 (Gary F. Moncrief ed. 2011) (discussing a project to enable the public instead of politicians to draw redistricting plans).

[35] *See* McDonald, *supra* note 11, at 380–84 (describing the functioning of redistricting

reversionary point if a state failed to redistrict, whereas, prior to *Baker*, the previous plan would have remained in force unless a state experienced a change in the number of congressional districts through apportionment.[36] Thus, a goal of these commissions was to ensure that redistricting plans were implemented without engaging the courts, which might adopt plans (or create their own) in opposition to political leaders' interests.

A second wave of redistricting reform began in the 1980s, more typically through the initiative process.[37] A hallmark of these recent reforms is that they are championed by good government groups and are intended to reduce the influence of politics in the redistricting process.[38] These commissions are modeled on bureaucratic redistricting institutions used in other countries in that ostensibly politically independent commissioners are tasked to draw lines following a set of traditional redistricting criteria.[39]

Some posit that traditional redistricting principles can act as a hedge against gerrymandering.[40] One should be cautious, however, about putting one's faith in traditional redistricting principles to produce politically neutral outcomes. Chief Justice Brennan pessimistically noted that following traditional criteria, such as drawing pleasing shapes, is a not a gerrymandering cure, stating that, "this politically mindless approach may produce, whether intended or not, the most grossly gerrymandered results . . . ."[41] And, as the next

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commissions in various states).

[36] *See* GARY W. COX & JONATHAN N. KATZ, ELBRIDGE GERRY'S SALAMANDER: THE ELECTORAL CONSEQUENCES OF THE REAPPORTIONMENT REVOLUTION 61 (2002) (finding that the equal population mandate erased a 6 percentage point Republican bias outside the South and increased the incumbency advantage).

[37] States that more recently reformed their redistricting processes through citizen-led ballot initiatives include Arizona, California, Florida, and Washington. Alaska and Idaho's legislatures amended their constitutions through legislative-proposed referendum during this period, but these reforms were designed primarily to reduce the influence of the governor in redistricting. *See* discussion *infra* Part III.

[38] For an alternative view on redistricting reform, see Daniel H. Lowenstein & Jonathan Steinberg, *The Quest for Legislative Districting in the Public Interest: Elusive or Illusory?,* 33 UCLA L. REV. 1, 4 (1985) (arguing that legislatures can be held accountable through elections while independent commissions are unelected and cannot be punished, that legislators know the communities in their districts the best, and that legislators are the best suited to deliberate the thorny trade-offs that are inherent in redistricting).

[39] For a survey of these commissions, see Lisa Handley, *A Comparative Survey of Structures and Criteria for Boundary Delimitation*, *in* REDISTRICTING IN COMPARATIVE PERSPECTIVE 265 (Lisa Handley & Bernie Grofman eds., 2008).

[40] *See* JONATHAN WINBURN, THE REALITIES OF REDISTRICTING: FOLLOWING THE RULES AND LIMITING GERRYMANDERING IN STATE LEGISLATIVE REDISTRICTING 9 (2008) ("Specifically, the principle against splitting political subdivisions plays a key function in constraining the remappers from gerrymandering.").

[41] Gaffney v. Cummings, 412 U.S. 735, 753 (1973); *see also*, FRANK R. PARKER, BLACK

section describes, facially neutral criteria such as geographic compactness are likely to systematically favor one party.

Indeed, more recent reforms also adopt "shall not favor" language indicating that a redistricting plan should not overtly benefit a party or candidate or go even further to require political outcomes, such as competitive districts.[42] As federal courts have established (mostly) consistent federal standards for redistricting, the political legal battles over redistricting have shifted to the state courts and allegations of violations of state criteria,[43] raising in importance an understanding of how these criteria are implemented.

III. A TYPOLOGY OF REDISTRICTING REGULATIONS

The history of redistricting inscribes a circular route from an emphasis on traditional redistricting principles; to, in the wake of *Baker*, an emphasis on population equality and minority voting rights at the expense of traditional redistricting principles; and returning to focus on traditional principles, with recent efforts by reformers to re-elevate respect for traditional redistricting principles. Coupled with the renewed emphasis on traditional redistricting principles is a recognition that they do not, alone, suffice to curtail gerrymandering, that political outcomes should be explicitly incorporated into redistricting criteria, and that these criteria must be considered by an independent redistricting body.[44]

Adam Cox devises a useful typology to describe three elements of redistricting regulation: process-based regulations, which are designed to constrain how the lines are drawn; outcome-based regulations, which are designed to prospectively produce a political outcome; and institution-selecting regulations, which are designed to alter who draws the lines.[45]

VOTES COUNT: POLITICAL EMPOWERMENT IN MISSISSIPPI AFTER 1965 153–56 (1990) (describing how an ostensibly neutral criterion was used to disguise a racial gerrymander in Hinds County, Mississippi); MICHAEL P. MCDONALD, THE MIDWEST MAPPING PROJECT (2009), *available at* http://elections.gmu.edu/Midwest_Mapping_Project.pdf (describing how traditional redistricting principles tend to result in pro-Democratic biases in five Midwestern states).

[42] Bruce E. Cain, Karin Mac Donald, & Michael McDonald, *From Equality to Fairness: The Path of Political Reform Since* Baker v. Carr, *in* PARTY LINES: COMPETITION, PARTISANSHIP AND CONGRESSIONAL REDISTRICTING 6, 26–27 (Thomas E. Mann & Bruce E. Cain eds., 2005).

[43] *Id.* at 17.

[44] *Id.* at 6–28.

[45] *See* Adam Cox, *Partisan Fairness and Redistricting Politics*, 79 N.Y.U. L. REV. 751, 756 (2004) (describing those three elements of redistricting regulation); *see also* Michael P. McDonald, *Regulating Redistricting*, 40 PS: POL. SCI. AND POL. 675, 675 (2007) (same).

Process-based regulations describe formalistic criteria that are applied to the drawing of districts; many of these are commonly known as 'traditional' redistricting principles. While we discuss specific examples, for the sake of space, we refer interested readers to complete lists of state criteria compiled by others.[46] These criteria include population equality, contiguity, compactness, respect for existing political boundaries, respect for communities of interest, preservation of district cores, and nesting of districts.[47] Process-based regulations constrain the choices available to a redistricting authority and are claimed to foster better constituent-representative linkages by aligning community and district boundaries.[48]

During the 1960s, federal courts applied a population equality standard for congressional districts in *Wesberry v. Sanders* and for state legislative districts in *Reynolds v. Sims*. For congressional redistricting, the federal courts (following *Karcher v. Daggett*) have generally adopted a *de minimis* standard requiring exact population equality, although they will allow deviations to achieve a compelling state interest.[49] The federal courts have allowed up to a 10 percentage-point range for state legislative districts.[50] The federally allowable range is a floor, and some states have enacted more restrictive population deviations for their state legislative districts.

Contiguity simply means that all parts of a district must connect. While generally non-controversial, example districts of questionable contiguity stretch across water, intersect another district over water or at a single point, are comprised of continuous land but are not navigable using existing transportation routes, or are connected only

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[46] *See* Levitt, *supra* note 11, at 29–36.

[47] *Id.*

[48] *See* Richard N. Engstrom, *District Geography and Voters, in* REDISTRICTING IN THE NEW MILLENNIUM 65, 74–77 (Peter F. Galderisi ed., 2005) (discussing and testing the hypothesis that alignment of community and district boundaries leads to higher voter turnout); Richard G. Niemi, Lynda W. Powell, & Patricia L. Bicknell, *The Effects of Congruity Between Community and District on Salience of U.S. House Candidates*, 11 LEGIS. STUD. Q. 187, 188–90 (1986) (exploring the relationship between community-district congruity and citizens' knowledge of congressional candidates, and finding that "the nature of the district is related to candidate awareness.").

[49] *See* Karcher v Daggett, 462 U.S. 725, 782 (1983) (articulating a *de minimis* population standard for congressional districts unless there is a compelling state interest). Arkansas, Iowa, and West Virginia drew districts out of whole counties in the 2000s. The constitutionality of these plans, however, was never tested in federal court. *See* MARTIS, *supra* note 17 (showing how prior to *Baker v. Carr* rural congressional districts were often drawn out of whole counties).

[50] *See* Brown v. Thomson, 462 U.S. 835, 842 (1983) ("Our decisions have established, as a general matter, that an apportionment plan with a maximum population deviation under 10% falls within this category of minor deviations."). *But see* Cox v. Larios, 542 U.S. 947, 949 (2004) (finding a state cannot systematically under-populate a party's districts within the ten percentage point range).

at a single point.[51] Compactness refers to the shape of a district, but is formally ill-defined. Scholars have proposed over fifty compactness measures, which have not resulted in clarity, since these measures conflict and can be manipulated.[52] Iowa is the only state that has adopted by statute an unambiguously defined quantitatively measurable compactness measure.[53] Otherwise, the federal and state courts have generally found constitutionally impermissible compactness violations based on visual inspection of the shape of a district.[54]

Redistricting authorities may be required to respect political, physical, and cultural boundaries. Some states require that district boundaries respect existing political boundaries, which may include counties, municipalities, cities, towns, villages, and even local precincts and wards. States may require districts to follow visible geographic features, such as rivers, mountains, or islands. States may require respect for communities of interest, which may include local government units, but may also include any identifiable geographic community that shares common social interests, economic interests, media markets, transportation corridors, or demographic factors.[55] These communities may straddle or be contained within local government units.[56] Even other legislative district boundaries may be respected, a practice known as nesting, which is particularly relevant when two or more lower chamber districts are wholly contained within a Senate district.[57]

Outcome-based regulations seek to achieve political goals. Among the most well-known political goals is the goal of minority representation that is enshrined in the federal Voting Rights Act and similar language found in some state constitutions. Volumes have been written and litigated concerning the Voting Rights Act, so we

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[51] *See* Altman, *supra* note 5, at 164 ("[B]reaches of contiguity may be difficult or impossible to avoid because of geographic obstacles, such as large bodies of water . . . .").

[52] *See* Richard G. Niemi, Bernard Grofman, Carl Carlucci & Thomas Hoffeller, *Measuring Compactness and the Role of a Compactness Standard in a Test for Partisan and Racial Gerrymandering*, 52 J. POL. 1155, 1156 (1990) (discussing the advantages and disadvantages of several compactness measures); Altman *supra* note 5, at 165–66 (same).

[53] IOWA CODE, Title II § 42.4.

[54] *See* Shaw v. Reno, 509 U.S. 630, 655–56 (1993) (finding North Carolina's 12th Congressional District adopted in the 1990s was "bizarre" in shape, and thus subordinated traditional redistricting principles to racial motivations).

[55] *See* Levitt, *supra* note 11, at 56 for a detailed description of these considerations with examples.

[56] For example, see COLO. CONST. art. V, § 47(3) stating "communities of interest, including ethnic, cultural, economic, trade area, geographic, and demographic factors, shall be preserved within a single district wherever possible."

[57] Levitt, *supra* note 11, at 66.

will only briefly describe it here.[58] Section 2 and section 5 of the Voting Rights Act may be considered outcome-based regulations. Section 2 applies nationally and the U.S. Supreme Court has articulated a three-prong test requiring minority opportunity districts to be drawn if a district can be drawn in a compact manner, there is racially polarized voting, and there is a past history of discrimination.[59] Section 5 applies to certain "covered" jurisdictions primarily in the South and requires that the Department of Justice or the District Court of D.C. determine if an adopted redistricting plan reduces minority representation from the previous plan.[60] If it does, the plan cannot take effect.

The U.S. Supreme Court has found that partisan gerrymandering is justiciable;[61] however, the Court has never overturned a redistricting plan because it was an impermissible partisan gerrymander. The Justices are currently divided 4-1-4, with four believing that partisan gerrymandering is a political question that cannot be adjudicated, four believing there is a standard that can be applied to detect a partisan gerrymander, and Justice Kennedy, who believes that partisan gerrymandering is justiciable, but had not identified a standard to his liking.[62]

Where the federal government has declined to take action to prevent partisan gerrymandering, some states have stepped into the void. Donald Stokes, an appointed tie-breaking member of New Jersey's state legislative redistricting commission, adopted a widely used political science method to measure the partisan bias of a redistricting plan and invited the political parties to bid for his vote by crafting a plan with the least degree of bias.[63] Recently, the Florida

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[58] *See generally* VOTING RIGHTS ACT REAUTHORIZATION OF 2006: PERSPECTIVES ON DEMOCRACY, PARTICIPATION, AND POWER (Ana Henderson ed., 2007) (collecting various studies on the Voting Rights Act); DAVID CANON, RACE, REDISTRICTING, AND REPRESENTATION: THE UNINTENDED CONSEQUENCES OF BLACK MAJORITY DISTRICTS 60–92 (1999) (discussing consequences of the VRA for black majority districts); DAVID LUBLIN, THE PARADOX OF REPRESENTATION: RACIAL GERRYMANDERING AND MINORITY INTERESTS IN CONGRESS 4–12 (1997) (providing an overview of the VRA and its impact on racial redistricting); QUIET REVOLUTION IN THE SOUTH: THE IMPACT OF THE VOTING RIGHTS ACT, 1965–1990 (Chandler Davidson & Bernard Grofman eds., 1994) (providing a thorough overview of the VRA and its impact in the South).

[59] Voting Rights Act, Pub. L. No. 89–110, 79 Stat. 437 (codified as amended at 42 U.S.C. §§ 1973–1973bb–1 (2006)); *see* Thornburg v. Gingles, 478 U.S. 30, 89–90 (1986) (articulating the three-prong test); Bartlett v. Strickland, 129 S.Ct. 1231, 1246 (2009) (requiring the demonstration district contain at least 50 percent voting-age population of the minority group).

[60] Voting Rights Act § 5, 79 Stat. at 439.

[61] *See* Davis v Bandemer, 478 U.S. 109, 113 (1986) ("[W]e find such political gerrymandering to be justiciable . . . .").

[62] *See* League of United Latin Am. Citizens v. Perry, 548 U.S. 399, 418–20 (2006) (opinion of Kennedy, J.) (examining various standards but not approving of any one).

[63] *See* DONALD E. STOKES, LEGISLATIVE REDISTRICTING BY THE NEW JERSEY PLAN

Supreme Court held that some state Senate districts violated a criterion adopted by a voter initiative in 2010 that states, "No apportionment plan or district shall be drawn with the intent to favor or disfavor a political party or an incumbent."[64]

Related to partisan gerrymandering is a concern that redistricting authorities—particularly incumbents—seek to diminish electoral competition by drawing safe districts.[65] To address this concern, Arizona, Washington, and Wisconsin (since repealed) have required competitive districts to be drawn with a balance of Democrats and Republicans.[66]

Institution-selecting regulations have most commonly taken the form of a redistricting commission that removes authority from legislatures. More generally, institution-selecting regulations place constraints on who creates and selects plans, what influences they are subject to, and under what conditions they may act.

The history of gerrymandering is replete with examples of legislators using the process to further their ambitions.[67] As the reform saw goes, in redistricting legislators choose voters rather than voters choose legislators. Redistricting authorities can use political information to affect electoral outcomes, such as the location of incumbent and challenger homes and the partisan composition of neighborhoods, to attempt to influence political outcomes. Some

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(1993); *see also* Bernard Grofman & Gary King, *The Future of Partisan Symmetry as a Judicial Test for Partisan Gerrymandering after LULAC v. Perry*, 6 ELECTION L. J. 2, 10 (2007) (discussing statistical approaches to measure degree of partisan bias); J. Morgan Kousser, *Estimating the Partisan Consequences of Redistricting Plans-Simply*, 21 LEGIS. STUD. Q. 521, 521 (1996) (predicting partisan consequences of redistricting plans).

    [64] FLA. CONST., art. III, § 21(a); *see also In re* Senate Joint Resolution of Legislative Apportionment 1176, No. SC12–1 (Fla. 2012), *available at* http://www.floridasupremecourt.org/sc12-1.pdf (interpreting the standards set forth in the Florida constitutional amendment); HAW. CONST. art. IV, § 6 (the first state to adopt the language "No district shall be so drawn as to unduly favor a person or faction.").

    [65] *See* Michael P. McDonald, *Redistricting and Competitive Districts, in* THE MARKETPLACE OF DEMOCRACY, ELECTORAL COMPETITION AND AMERICAN POLITICS 222, 227, 229 (Michael P. McDonald & John Samples eds., 2006) (discussing incumbent protection gerrymanders). For a contrary opinion, see THOMAS L. BRUNELL REDISTRICTING AND REPRESENTATION: WHY COMPETITIVE ELECTIONS ARE BAD FOR AMERICA 75–89 (2008) (arguing that uncompetitive districts are desired to minimize the number of people who vote for the losing candidate).

    [66] For examples of the requirements, see WASH. REV. CODE § 44.05.090 (2011) and ARIZ. CONST. art. IV, part 2, § 1; WIS. STAT. § 4.001(3) (1981) (repealed 1983).

    [67] Paul J. Webber, *Madison's Opposition to a Second Convention*, 20 POLITY 498, 489–517 (1988) (describing how Patrick Henry attempted to draw his political foe—James Madison—out of his district); *see, e.g.*, John Mercurio, *Between the Lines*, ROLL CALL, July 2, 2001 (describing how candidate Marty Castro was drawn out of Rep. Luis Gutierrez's district in Illinois). The very name "gerrymander" comes from a Massachusetts state legislative district proposed by Gov. Elbridge Gerry in 1812, drawn in the shape of a salamander with the intent of favoring the Federalist Party. COX & KATZ, *supra* note 36, at 3.

states, such as Iowa, blind those drawing the lines from this political information, with the hope that a blind process produces a neutral result.[68] As stated above, Chief Justice Brennan and others might disagree that a blind person casting a dart is capable of reliably hitting a bulls-eye without assistance.

As described above, many of the early commissions were not designed to be politically neutral: elected officials or their lieutenants served on them with the purpose to concentrate political power in party leaders. More recent commissions are designed to reduce political influence in redistricting through regulating the selection and activities of commissioners. The 1960 Alaska constitution was first to limit who could be selected to a redistricting commission, requiring that "none . . . may be public employees or officials."[69] Hawaii and Missouri forbid their commissioners from running for office in the districts they draw.[70] Arizona and California impose both regulations, and further require an agency to vet prospective commissioners to weed out any partisan wolves in sheep's clothing.[71] Similar constraints may be implemented through norms. The New Jersey Supreme Court—responsible for selecting the tie-breaking member of the state's commissions—has traditionally selected a neutral tie-breaking member and the Iowa advisory commission's reputation for neutrality flows from the professionalism exhibited by the legislative support staff tasked with drawing plans.[72]

IV. THE PROMISE OF INFORMATION TECHNOLOGY

No redistricting plan can satisfy everyone, barring the 'utopia' Madison describes in Federalist 10 in which, "every citizen [had] the same opinions, the same passions, and the same interests."[73] In such a situation, redistricting would have no effect on representation—as all districts lines would result in the same representational outcome. Redistricting is thus inherently about balancing competing representational goals, while conforming to existing geography and demography. For example, political units may have oddly shaped or even non-contiguous geography, which can result in non-compact or even non-contiguous districts.[74] A distinctive characteristic of

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68 IOWA CODE § 42.4(5) (2011).

69 ALASKA CONST. art. VI, § 6.

70 HAW. CONST. art. IV, § 2; MO. CONST. art. III, § 7.

71 ARIZ. CONST. art. IV, Part 2, § 1(3); CAL. GOV'T CODE § 8251 (West 2005 &. Supp. 2012).

72 STOKES, *supra* note 63.

73 THE FEDERALIST NO. 10, (James Madison).

74 *See* McDonald, *supra* note 41, at 155 (describing how Wisconsin's 61st Senate district

redistricting, then, is that these goals are balanced, and constraints satisfied, through the application of expert judgment.

In the twentieth century, process-based, outcome-based, and institution-selecting regulation failed to tame the gerrymander in the United States. The twenty-first century has brought a number of technological innovations and consequent changes in our understanding of redistricting regulation. We posit that redistricting in the twenty-first century can use information technology to improve governance.

While we are optimistic about the ability for technology to reveal new process measures and re-imagine old ones, we are cautious about the ability for computers to 'solve' the gerrymandering problem. As early as the 1960s, scholars posited that computers could be programmed to automatically draw districts that best achieved a set of criteria in an ostensibly politically neutral manner.[75] While we are enthusiastic proponents of a positive role for technology in redistricting, we are skeptical about the ability for computers to be programmed to provide a solution to gerrymandering.[76] In addition to the potential for political bias to be hidden within the criteria chosen to be implemented, the optimization problem is too difficult for all but the simplest redistricting problems.[77]

A. Information Technology & Process-Based Regulation of Redistricting

While we believe that process-based regulations have diminished in importance, many reformers, scholars, and courts still highly value them. In a given context, such as to promote policy congruence between local government officials and state representatives, they may be highly relevant.

The opportunities for use of, and our understandings of, pure process-based regulation of redistricting are changing. On the one

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in the 2000s was non-contiguous because it followed a Racine ward that itself was non-contiguous. The state addressed this situation by simply defining wards as contiguous in Wis. Stat. 5.15(1)(b)); *see also* Hall v. Moreno, 270 P.3d 961, 980 (Colo. 2012) (adopting a redistricting plan proposed by the Democratic Party partially on the grounds that it contained a greater number of competitive districts.)

[75] *See* William Vickrey, *On The Prevention of Gerrymandering*, 76 Pol. Sci. Q. 105, 106 (1961) (imagining a "completely mechanical" process in which "the human element [is] removed as completely as possible from the redistricting process").

[76] Micah Altman & Michael P. McDonald, *The Promise and Perils of Computers in Redistricting*, 5 Duke J. Const. L. & Pub. Pol'y 69 (2010).

[77] Micah Altman & Michael P. McDonald, *BARD: Better Automated Redistricting*, 42 J. Statistical Software 1, 28 (2011), *available at* http://www.jstatsoft.org/v42/i04.

hand, the formal importance of geographic criteria, such as compactness and conformance to political boundaries has diminished. As we discussed above, the emphasis on equal-population ushered in by *Baker*, in effect, forced other criteria to play, at best, a secondary role.

As important, formal geographical criteria have been justified, in large part, because they are claimed to act as a proxy for transportation costs, communication costs, and campaign costs. Advances in communication technology have greatly weakened the connection between geographic distance and communication costs. And these advances, along with the widespread availability of detailed "micro-targeting" databases of information on voters—have enabled campaigns to much more effectively and economically target persuadable voters within districts rather than relying on district-wide campaign communication.[78]

Another reason that traditional process measures have been used in practice, is that they were relatively easy to compute. As we describe in the next section, technological advances have made the computation of most imaginable outcome measures straightforward. This, too, diminishes the need for traditional process measure that are designed to serve as a proxy for outcome measures, such as limiting gerrymandering. Furthermore, computation-intensive analysis of process measures, enabled by computing advances, has identified potential biases—such as the tendency of compactness criteria to advantage the Republican party, because its support tends to be more evenly distributed geographically.[79]

We hypothesize that information technology can enable new forms of geographical process measures that are based on crowd-sourced data. These measures are still in their infancy, but two emerging research directions are especially notable. The first direction is exemplified by the efforts of information scientists and geographers to analyze massive amounts of opportunistically collected individual

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[78] D. SUNSHINE HILLYGUS & TODD G. SHIELDS, THE PERSUADABLE VOTER: WEDGE ISSUES IN PRESIDENTIAL ELECTIONS (2009).

[79] *See* Micah Altman, *Modeling the Effect of Mandatory District Compactness on Partisan Gerrymander*, 17 POL. GEOGRAPHY 989, 989 (1998) (analyzing geographic compactness standards); Jason Barabas & Jennifer Jerit, *Redistricting Principles and Racial Representation,* 4 ST. POL. & POL. Q. 415, 415 (2004) (analyzing the effect of traditional redistricting principles on minority representation in congressional districts); Jonathan Rodden & Jowei Chen, *Using Legislative Districting Simulations to Measure Electoral Bias in Legislatures* 1 (Soc. Pol. Methodology, Working Paper No. 1213, 2010), *available at* http://polmeth.wustl.edu/media/Paper/ChenRodden.pdf ("When partisan preferences are spatially dependent and partisanship is highly correlated with population density, any districting scheme that generates relatively compact, contiguous districts will tend to produce bias against the urban party.").

data, such as the temporal activity patterns from mobile-phone location traces, to identify travel patterns, land usage patterns and neighborhoods.[80] Rather than "identifying" neighborhoods using demographic data, which requires making assumptions about what demographic characteristics are most relevant to community, this innovative line of research infers the presence of neighborhoods and communities from common patterns of activity and/or shared activities.

The second direction is to enable individuals to identify their own communities using participative GIS on the web. This is an approach we have taken in building the DistrictBuilder software.[81] The community mapping functionality, added in the last released version of DistrictBuilder, is, to our knowledge, entirely unique. An important aspect of drawing a redistricting plan is identification and consideration of communities of interest—but this has, until now, occurred in an ad-hoc way. The software extensions enable users to draw their own communities, independent of any particular redistricting plan; and to display and evaluate districting plans using their own community maps and community maps published by other users. Potentially, this can allow community boundaries to emerge organically from user input.

B. Information Technology & Outcome-Based Regulation of Redistricting

Advances in computing technology and statistical methodology have enabled relatively robust predictions across a wide range of types of electoral outcomes likely to result from any proposed redistricting plan.[82] Among the many methodologies in use as outcome measures, Andrew Gelman's and Gary King's bias and responsiveness predictions have received the most recent scholarly recognition.[83] It is easy, however, to conflate the prediction of electoral characteristics of plans with the detection of gerrymanders

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[80] *See, e.g.*, Giusy Di Lorenzo & Francesco Calabrese, Identifying Human Spatio-Temporal Activity Patterns from Mobile-Phone Traces 1069–1074 (paper presented at 14th Int'l IEEE Conf. on Intelligent Transportation Systems, Oct. 5–7, 2011), *available at* http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6082974 (identifying human activity through mobile phones); Francesco Calabrese et al., *Eigenplaces: Segmenting Space through Digital Signatures*, 9 IEEE PERVASIVE COMPUTING 78 (2010), *available at* http://hdl.handle.net/1721.1/52542 (using eigendecomposition to leverage network activity data and find correlations to the physical environment).

[81] Altman & McDonald , *supra* note 76.

[82] For a non-technical description of how election results can be predicted and indicia derived from these generally, see Grofman & King, *supra* note 63, at 10–12.

[83] Andrew Gelman & Gary King, A Unified Method of Evaluating Electoral Systems and Redistricting Plans, 38 AM. J. POL. SCI. 513 (1994)

based on such predictions. The former has become fairly easy, whereas the latter remains deeply challenged.[84]

One fundamental statistical limitation of such forecasting methods, as Gelman and King explain, is that they are predictive, not causal models, and are inferentially unrelated to gerrymandering. For example, as we have alluded to previously, a compactness standard generally favors the Republican Party. If a state has a compactness criterion in its state constitution, a naive interpretation of estimate predicting a Republican 'bias', may suggest that a Republican gerrymander occurred when in fact a redistricting authority was faithfully following legitimate legal constraints. A partisan unbiased redistricting plan may not exist, or may violate any number of other criteria.

A second, and fundamental substantive limitation to these methods is that neither the courts nor social scientists have reached consensus on what outcome criteria should be applied. [85] As it turns out, it is provably impossible to create districts that optimize all candidate outcome criteria simultaneously, thus trade-offs among potential "good" outcomes are inevitable. And no one redistricting plan is likely to score highest on all the criteria that may be agreed upon to be desirable, even assuming a local consensus exists. How one values, for example, preserving communities versus having competitive districts is a trade-off that requires human judgment. There is no common dimension to these criteria, and the courts have been reluctant to issue guidance on such trade-offs in all but the most egregious violations.

Information technology does offer some hope. The development of a new generation of software, such as our DistrictBuilder system,[86] has enabled members of the public to create hundreds of real redistricting plans—plans based on official census data, and satisfying all of the criteria required by law. The existence of this large corpus of plans for the first time is beginning to enable an empirical analysis of redistricting plans that both expands our understanding of the range of redistricting outcomes that are feasible in practice, and illuminates the trade-offs that members of the public tend to view as most desirable.

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[84] *See generally* Altman & McDonald, *supra* note 76, at 77–88 (discussing the use of computing in evaluating and automating redistricting plans).

[85] *See* Altman & McDonald, *supra* note 76, at 83–84 (describing this lack of agreement).

[86] DISTRICT BUILDER, http://www.districtbuilder.org (last visited May 10, 2012).

C. Information Technology and Institution-Selecting Regulation of Redistricting

Technology has fundamentally changed the process of redistricting. Starting in the 1990s, geographic information systems were developed to aid those drawing redistricting plans. Computerized redistricting was an enormous leap forward in productivity from drawing districts on paper maps.[87] Still, these early computer systems were prohibitively expensive for all but the best-funded organizations to develop and implement.

By the 2000 round of redistricting, computers had greatly increased in speed, decreased in cost, and become a ubiquitous part of redistricting. Simultaneously, the rapid expansion of the Internet and World Wide Web enabled redistricting authorities to disseminate information about redistricting widely and cheaply—if they were inclined to do so. Writing in 2005, we noted:

> Advances in technology seemed to offer the potential for deeper change, in a number of ways that have not been widely discussed: First, computing technology has the potential to change how politicians deliberate over proposed districts, since changes to district maps that would have taken days to make in the 1980's and even 1990's can now be made in minutes or hours, and because software now allows plans to be quickly presented and accurately compared. (One software developer we interviewed even drew particular attention to the popularity of the feature that allowed two plans to be compared to determine exactly where they differed.) Second, computing technology has opened the door to electronic submissions of maps drawn by the public and by interest groups, since redistricting software is now both relatively inexpensive and easy to use. Third, computing technology enables the use of richer data sources in a shorter period of time. In the past, because of the time-constraints under which redistricting takes place, and the difficulty of managing the computing and data, data-sources reflecting communities of interest were much more difficult to incorporate.

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[87] *See* Micah Altman, Karin Mac Donald & Michael McDonald, *Pushbutton Gerrymanders?: How Computing Has Changed Redistricting*, in PARTY LINES, *supra* note 42, at 51–63 (surveying the use of computers in redistricting in the 1990 and 2000 rounds of redistricting).

At the same time—there is no evidence that this potential has been realized to any great extent: Ease of deliberation is important only when political actors choose to deliberate. Public submission of plans makes a difference only when they are likely to be considered by a redistricting authority. A criterion such as "communities of interest" can only be applied when the appropriate data is collected and made available. These are, fundamentally, political issues, and we have not been able to uncover evidence that computing technology has, as yet, significantly altered them.[88]

By the 2010 round of redistricting, redistricting software was low cost, computing power increased tremendously, and the data were generally readily available such that:

Mappers were able to specify a desired outcome or outcomes—the number of people in a district, say, or the percentage of Democrats in it—and have the program design a potential new district instantly. These systems allow redistricters to create hundreds of rough drafts easily and quickly, and to choose from among them maps that are both politically and aesthetically appealing.[89]

Moreover, in contrast to the previous round of redistricting, we are now seeing indications that technology is leading to an increase in the transparency of redistricting, and to an increase in public participation in redistricting.[90] First, state legislative authorities are making proposed redistricting plans available online in the vast majority of states—a substantial increase relative to ten years ago. Second, substantially more of the electoral data needed for redistricting is available in this round of redistricting, due in large part to the efforts of individual academics and foundations acting in the public interest to collect, aggregate, clean, and disseminate public-use data. Third, online redistricting sites have enabled members of the public to create hundreds of legal plans—an increase of two orders of magnitude.

The desirability of increased transparency and participation is being recognized at the highest levels of government.[91]

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[88] Micah Altman & Michael McDonald, *From Crayons to Computers: The Evolution of Computer Use in Redistricting*, 23 Soc. Sci. Computer Rev. 334, 343 (2005), *available at* http://ssc.sagepub.com/content/23/3/334.full.pdf+html.

[89] Don Peck & Caitlin Casey, *The Nation in Numbers: Packing, Cracking, and Kidnapping: The Science of Gerrymandering*, Atlantic Monthly, Jan./Feb. 2004, at 50, 50–51.

[90] Altman & McDonald, *supra* note 34, at 247–48.

[91] *See* Memorandum on Transparency and Open Government, 74 Fed. Reg. 4685, 4685

Correspondingly, an emerging institutional principle for redistricting is the availability of data and open software to enable the public creation and evaluation of redistricting plans.

In essence, open online redistricting is an institution-selecting mechanism. In its strongest form, open public redistricting online has the potential to shift the actors directly responsible for redistricting from a small number of legislators or commissioners to a much larger public.

In a weaker form, where a smaller group is ultimately responsible for the selection of a redistricting plan, as will be the case in many places for the foreseeable future, open public redistricting may constrain redistricting. Public redistricting creates a corpus of evidence that is both broader and more detailed than what has been previously generated through independent commissions, and this evidence reveals geographical communities, public preferences over redistricting, and the range of possible redistricting outcomes achievable. When this evidence is a matter of public record, commissioners may be more constrained in their action; and the courts more willing to infer partisan intent where the resulting plan deviates substantially from public input.

Specific principles for open access to government information are also becoming widely recognized. In October 2007, thirty open-government advocates met in Sebastopol, California to discuss how government could make data open to the public in a systematic and principled way. The conference, led by Carl Malamud and Tim O'Reilly, and funded by a grant from the Sunlight Foundation, resulted in a list of eight principles, which were later expanded and updated by the foundation, to form their current "Ten Principles for Opening Up Government Information": completeness, primacy, timeliness, ease of physical and electronic access, machine readability, nondiscrimination, use of commonly owned standards, public domain licensing, permanence, and elimination of usage costs.[92]

(Jan. 21, 2009) (stating that the Obama administration "is committed to creating an unprecedented level of openness in government."); OFFICE OF THE PRESIDENT OF THE UNITED STATES, OPEN GOVERNMENT: A PROGRESS REPORT TO THE AMERICAN PEOPLE 1 (2009), *available at* http://www.whitehouse.gov/sites/default/files/microsites/ogi-progress-report-american-people.pdf (stating that the Obama administration would usher in "a new era of open and accountable government meant to bridge the gap between the American people and their government.").

[92] *Ten Principles For Opening up Government Information*, SUNLIGHT FOUNDATION (Aug. 11, 2010), http://sunlightfoundation.com/policy/documents/ten-open-data-principles; *see also* David G. Robinson et al., *Government Data and the Invisible Hand*, 11 YALE J. L. & TECH.

In 2010, with the support of the Sloan foundation, the Brookings Institution, and the American Enterprise institute, we convened an advisory board to develop guiding principles for transparency in redistricting. The advisory board members included key redistricting experts at Common Cause and the League of Women Voters, experienced redistricting consultants, and bipartisan representation from elected officials. Thomas Mann at the Brookings Institution and Normal Ornstein at the American Enterprise Institute directed the advisory board. The board issued principles for transparency and public participation in redistricting. These principles are in the same spirit as the Sunlight principles and require free electronic access to the complete information necessary for the public to "verify, reproduce and evaluate" all proposed redistricting plans. The AEI-Brookings principles also recognize that the redistricting process is so complex that software is a practical necessity—transparency in redistricting also requires that software be made available to reproduce and evaluate redistricting plans proposed by the legislature. And this software should itself be transparent—preferably through use of open source, or if necessary, through documentation sufficient for complete independent replication of the results.[93]

While barriers to public participation and transparency in redistricting have been lowered, challenges remain, particularly with respect to how redistricting authorities make available the election, geographic, and population data necessary to create legal redistricting plans, and the format in which they release their redistricting plans.[94]

Nearly all states participate in what is known as Phase 2 of the Census Bureau's redistricting data program in which states and localities transmit their political boundaries, including precincts and wards, to the Census Bureau, for inclusion in the geography that the Census Bureau uses in reporting population summaries.[95] Electronic representations of election boundaries described in terms of census geography enable one to merge together census data and election

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160, 170 (2009) (proposing the simple principle that "federal government's primary objective as an online publisher is to provide data that is easy for others to reuse.").

[93] Micah Altman, Thomas E. Mann, Michael P. McDonald, & Norman J. Ornstein, *Principles for Transparency and Public Participation in Redistricting*, THE BROOKINGS INSTITUTE (June 17, 2010), http://www.brookings.edu/opinions/2010/0617_redistricting_statement.aspx.

[94] As co-principle investigators of the Public Mapping Project, we constructed merged census and election data for a number of states and localities to be used with our software. We describe here some of the challenges that we faced.

[95] 2010 Census Redistricting Data Program Commencement of Phase 2: The Voting District/Block Boundary Suggestion Project, 72 Fed. Reg. 19879 (Apr. 20, 2007).

results, so that the electoral consequences of a redistricting plan can be predicted.

There are two challenges to the integration of election data with census data. First, some states—such as Oregon and Rhode Island—do not transmit election boundaries to the Census Bureau, but rather they must be collected from election officials and expressed in the census geography. Some states and localities change their election boundaries at each election, requiring those who wish to evaluate a wide range of elections to collect and reconcile these boundaries. While some states collect, process, and publicly release these data, in other states consultants to the political parties collect this information and keep it private. A state that wishes to promote redistricting transparency and public participation should participate fully in Phase 2 of the Census Bureau data collection effort and make publicly available changes to election boundaries.

Second, some states do not report complete election data for their precincts. For example, Georgia and South Carolina report precinct-level election-results only for persons who voted in-person on Election Day. Persons who voted early are reported in separate county-wide precincts. Predictions of election outcomes may be misleading if persons who voted in-person differ from those who voted early and there is a substantial number of early voters. Other states faced with a similar problem chose to report non-precinct election results by voters' home precinct,[96] which is the best method of addressing this issue.

A redistricting authority can reduce public participation and transparency in the redistricting process by limiting access to the geographic boundaries that are required by law to be used in redistricting. For example, Ohio did not transmit the correct boundaries of their precincts, wards, and local governments to the Census Bureau, which was a rather serious issue since the Ohio constitution requires state legislative districts to respect local government and election boundaries.[97] The state commissioned a consultant to digitize the correct boundaries for the state legislative redistricting. The authors supported an Ohio coalition of redistricting advocacy groups and found that the multiple releases of the consultant's database issued to fix problems (some of which we had originally identified) caused costly rework and technical challenges, thereby impeding the advocates' ability to fully participate in the

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[96] *See, e.g.,* COL. CODE. REGS. § 1505–1:38.12 (2007) (requiring vote center—essentially at-large precincts—election results from June 16, 2006 and onward to be reported by voters' home precincts.)

[97] OHIO CONST. art. 11, § 07.

redistricting process. This situation would not have occurred if Ohio had worked fully with the Census Bureau to define its geography.

A redistricting authority can reduce public participation and transparency by limiting access to correct population data. For example, leading into the 2010 redistricting New York passed a law that called for the reallocation of prisoners to their residence of origin for the purposes of state legislative redistricting.[98] The state legislature's Legislative Task Force, the entity responsible for constructing these data, delayed nearly a year. The prison-adjusted population data was released the same week the Legislative Task Force released their draft redistricting plans, which made it difficult for advocates to evaluate the plans and to propose their own as alternatives. This situation illustrates the importance of the timely release of data.

A redistricting authority can reduce public participation and transparency by releasing data in forms that are difficult to use. Redistricting software commonly describes redistricting plans in a format known as the block equivalency file. In this format each census block—the lowest level of census geography—is assigned to a corresponding district. All redistricting authorities, all of which use commercial redistricting software, are capable of releasing plans in this common format, but not all do. Some states simply provide images of proposed plans—which may not even provide enough detail to distinguish boundaries unambiguously; some provide what are known as "metes and bounds," which literally describe the boundaries of districts in terms of roads, cities, rivers, and other features; and some report plan components, which is a hierarchical listing of census geography from counties down that are wholly contained in each district. All three of these alternative methods of disseminating plans are not easily imported into redistricting software, thereby posing a challenge to independent evaluation of proposed plans. Some states have made advances towards greater transparency, and we urge more to do so. New York, a state that traditionally has released plans in metes and bounds, released block equivalency files this cycle.

CONCLUSION

New technologies hold great promise for increasing transparency and public participation in the redistricting process. These technologies are enabling the public to view redistricting plans as

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[98] N.Y. LEGIS. LAW § 83–m(13) (McKinney 1991 & Supp. 2012).

they are proposed, evaluate them for compliance with traditional redistricting principles and political effects, and even propose their own alternatives:[99] These uses of technology highlight an emerging set of institutional principles to promote public participation and transparency in redistricting for the twenty-first century: First, redistricting authorities may disseminate information on the Internet, such as proposed maps, meeting transcripts, and reports of district. This reduces barriers to monitoring the redistricting process. Second, they may make data available describing proposed districts in ways that enable independent evaluation. This facilitates forecasting of redistricting outcomes. Third, they may make software available to enable the public to propose their own plans. This puts pressure on the institutions of redistricting to be accountable. Finally, with lowered barriers of entry for those interested in drawing districts, redistricting authorities may accept plans and comments from the public. And this would shift the institutions of redistricting toward greater independence from political forces.

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[99] For a review, see Altman & McDonald, *supra* note 76, at 98–101.