Local Government Studies, 2015
http://dx.doi.org/10.1080/03003930.2015.1084926

Routledge
Taylor & Francis Group

Rewards and Consequences: Redistricting on the Chicago City Council

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ABSTRACT *The challenges of understanding gerrymandering are primarily related to its conceptual ambiguity and measurement. This is true despite landmark legal rulings and a rich literature on the subject. In an attempt to alleviate some of the confusion, theories of the gerrymandering process are combined with advanced quantitative and mapping techniques. The focus is on Chicago, where it is frequently claimed that gerrymandering is institutionalised; however, there has not been sufficient study of the causal connections between gerrymandering and a ward's racial makeup. Employing a mixed methods approach which combines a case study of the 2011–2012 redistricting in Chicago with quantitative analysis of Decennial Census and data from the Chicago Data Portal, this article examines the remapping of Chicago from early 2012 (effective in 2015 and matched with 2010 Census data) to assess how potentially gerrymandered districts are diluting or concentrating vote share of racially homogeneous groups.*

KEY WORDS: Chicago politics, gerrymandering, geospatial mapping, racial politics, Chicago City Council

Introduction

The processes behind gerrymandering are not for the faint of heart. Corruption, class conflict, inter-ethnic rivalry, personal feuds and above all partisanship have marked the history of drawing electoral boundaries in the United States. This provides a staple for political science; the cartoon of Governor Elbridge Gerry's notorious early nineteenth century manipulation of the northern outskirts of Boston are a staple of even introductory classes and general interest news coverage. Partisan gerrymandering has dominated this field in part because of the obvious possibilities for nefarious political advantage and the relative ease of measuring the impact of partisan vote share in a polity vis-à-vis partisan seat share in a legislative body. But the other motives for gerrymandering are powerful as well – and may occur where no partisan labels are present on a ballot

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paper. It is these factors, set in the city of Chicago, with which we are concerned. Deeply entrenched ethnic rivalries, past patterns of discrimination and persistent conflicts over economic development provide the motive; the conflict plays out on a city council that has been, by state law, non-partisan since the mid-1990s but has continued to see ever more aggressive manipulations of the boundaries of its 50 wards.

Measuring this formally remains a major challenge. For one thing, the very definition of gerrymandering itself remains contested. Even the courts are challenged by the task of defining it. The Supreme Court has ruled that strangely shaped districts can be subject to scrutiny, and that if a redistricted map 'is so bizarre on its face that it is unexplainable on grounds other than race', it can be reversed (*Shaw v. Reno*, 1993; *Miller v. Johnson*, 1995) (Ely 1998; Issacharoff 2002). The Court's verbiage is unhelpful in terms of clarifying the concept of gerrymanding and, in fact, adds a layer of complexity. First, court language does not formally define either 'bizarre' or a 'community of interest', the latter in some way legitimising the former according to the *Shaw* ruling.[1] Second, it is 'discriminatory cartography' (O'Loughlin 1982) in the sense that, when there are multiple races competing for representation at the governmental level, 'winners' will have to be chosen. In times of significant population shifts, this means that decisions to redistrict may be subject to political calculation; that is if the people living in the district or if the current representative of an existing district have squandered their political capital, they expose themselves to retribution by the chief executive or other representatives. Reinforcing redistricting along racial lines thus means that, even for well-represented racial groups, there are no guarantees of having racially representative elected officials. These remapping efforts can also lead to inconsistencies in the 'one person, one vote' principle, a constitutional violation at even the local level (Briffault 1993).

An even more awkward challenge emerges in determining what precisely to measure. Many local governments, especially in southern and western states, lack partisan elections. Our test case, Chicago, has lacked partisan elections in local office since a Republican-controlled state legislature in 1995 removed party labels from municipal voting in an ultimately unsuccessful attempt to gain political strength in the city. Drawing connections between ward boundaries, demographic change and inter-ethnic power politics are certainly feasible with Chicago's current case providing an interesting and enlightening example due to the aggressiveness of its recent districting processes. However, those are not the only things that define political competition. Evidence exists that ward mapping in Chicago is used to reward pro-mayoral aldermen and penalise those who significantly dissent from the administration line (Studenkov 2012; Zmuda and Simpson 2013).[2] And, there are visual differences on the map from one part of the city – differences in boundaries which correlate with rapidly changing neighbourhoods, while the more stable parts of the city tend to have ward lines that correspond to court definitions of non-gerrymandered districts. In other words, there is an indication of ward districting in rapidly changing parts of

the city being used to reward or penalise aldermen depending on circumstances (Meyerson 2012).

The differing motivations for gerrymandering in the local non-partisan environment demand a different approach from the study of gerrymandering in Congress and state legislatures. Rather than focusing on partisan advantage and possible violations of the Voting Rights Act (VRA),[3] as it has been traditionally done, this article uses Chicago's recent city council political history as a test case for establishing a better means of defining gerrymandering. We then provide a composite measure for differences between old and new district maps. The absence of political party labels coupled with the extreme weakness of the Republican Party in the city at the state and congressional level enable us to focus on other causes of and motives for gerrymandering. A focus on Chicago also allows us to isolate the effects of political actors and institutions at the city level and thus control for the connections to political forces at the state or federal levels.[4] Finally, Chicago presents an ideal case because the methods developed here can be readily applied to partisan differences as well as to new qualities shared across a polity.

At the core of Chicago mapmaking is the city's history of intense racial segregation, ranking fifth on the scale of most segregated American cities (Logan and Stults 2011).[5] To understand how race continues to be tied to political success or failure in Chicago, we must acknowledge that rewards and punishments for members of the city council often emerge at the physical margins of the wards, where both potential voters and businesses may be attractive prospects to the incumbent's re-election. Wards have taken on bizarre shapes in an attempt to adhere to the VRA's one-man-one-vote requirement in a time of rapidly changing demographics, but they can also represent a political cost or benefit by, respectively, decreasing or increasing supportive constituents. Introduced here, thus, is the theoretically analogous concept of factional gerrymandering, where a faction is an individual or a group of aldermen who stand to gain electoral advantage over putative intra-party opponents by influencing the ward re-mapping process. The factions most significant for the 2011–2012 redistricting effort in Chicago reflect race-based representation; thus, 'racial gerrymandering' more appropriately captures the essence of the events of 2011–2012.

Literature review

Research on gerrymandering provides broad guidance but all too little in the way of detailed information of the type of local politics which are the focus here. Existing research focuses, firstly, on the role of the VRA and the extent to which it constrains political abuse of power. The Supreme Court has debated extensively over how, in the context of the VRA of 1965, safeguards can be implemented to prevent abuses when an electoral district is restructured to provide advantage to an incumbent representative, a political party or a particular ethnic group (Ely 1998). Studies of this problem and the modelling of gerrymandering

are primarily done with regard to Congress (Shotts 2001), individual states (Forest 2005; Cranor, Crawley, and Scheele 1989) or the role of the courts in determining unconstitutionality of redistricting (McKenzie 2012).

Factional manoeuvring for political advantage provides more appropriate but still limited insight into the local environment, as it is typically framed within a partisan environment. Essentially, factional gerrymanding describes a coordinated effort among multiple politicians to increase their electoral advantage over opponents by supporting a remapping of district boundaries. Factional gerrymandering can be institutionalised and thus legitimated when the majority of the population supports or is passive about redistricting (Polsby and Popper 1993), a phenomenon identified by Simpson (2001) with regard to the growth in the number of 'black wards' Chicago from the 1940s up through the 1980s. These insights provide a significant addendum to the existing literature by highlighting the key determinants of city-based elections: incumbency (Krebs 1998; Lieske 1989; Trounstine 2013; Vickrey 1961), campaign funding and spending (Fleischmann and Stein 1998; Krebs 1998; Gierzynski, Kleppner, and Lewis 1998; Krebs 2005), newspaper endorsements (Krebs 1998), involvement as a political aide (Krebs 2001) and how the elected officials deal with issues like racial conflict (Kaufmann 2004).

Members of the faction responsible for gerrymandering can be considered part of the 'machine coalition' (Krebs 2005),[6] coordinating across influential districts (Kasperson 1965). We can identify the occurrence of factional gerrymandering when the challenges of remapping districts are so great and the minutiae of coordination are so extensive that change in the absence of a faction is virtually impossible. That appeared to be the case for the ward remap in Chicago, where 41 aldermen voted in support of the redistricting. Those that voted against the remapping – Aldermen from the 2nd, 32nd, 36th and several other wards – paid substantially by losing supporting constituents or, in the case of the 2nd ward, losing all of their constituents through a complete relocation of the district. Complete relocations of political districts are not uncommon, evidenced by the recent redistricting efforts in California and Iowa. In those cases, however, all districts were reassigned. In the case of the 2nd ward in Chicago (and several other wards), these were the exceptions.

Factional gerrymandering-based research spans from the municipal to the state levels; racially driven gerrymandering has been studied only at the municipal level. The core literature on this subject, such as Betancur and Gills (2004) and Engstrom and Wildgen (1977), frames gerrymandering as being primarily motivated by animus against minority groups. We attempt here to broaden that focus to study ward shifts in Chicago that may reflect political preferences and goals rather than simply power relations for or against a district's natural constituency, where 'natural constituency' means a community of common interest that has both a geographic and socially distinct character independent of political imposition (Owens 2012; Venkatesh 2001).[7] In the case of Chicago, the new aldermanic ward boundaries, approved in early 2012 and effective in 2015, are not just intuitively but, as we shall demonstrate, quantitatively more gerrymandered than

the previously existing scheme. Considerable scrambling of lines took place on an already convoluted map as white aldermen competed for the diminishing number of white residents on the southwest side while Latinos pushed to rectify their long inadequate representation. Simultaneously, African Americans tried to shore up population losses in their wards with rapidly gentrifying territory nearby. In this way, and consistent with the call to look beyond partisan aspects of districts when analysing gerrymandering (Johnston 2002), we recognise here that Chicago's wards have a politically and geographically representative function. The decision-making process of mapping the wards anew with each decennial census deserves much more jaded scrutiny.

The 2011–2012 redistricting in Chicago

The current study would not be complete without a narrative of recent events, and the most recent redistricting in Chicago 'had it all'. For example, and mentioned already, the 2nd ward was entirely moved from its traditional home on the near South Side to the opposite side of downtown, effectively ending the career of its alderman, Bob Fioretti, a political opponent of Mayor Rahm Emanuel. Several other wards saw profound changes, and more broadly an intense fight emerged in which African American politicians, critical in ensuring Emanuel's mayoral victory in the first round of voting in 2011, cashed in political favours and preserved a substantial share of the city council in the face of an apparently hopeless demographic situation. Overall, four patterns emerge which will be discussed here – first, an intense, ethnically driven conflict on the city council to which the mayor was a late participant; second, the noteworthy success in 2012 of African Americans in preserving their political position despite heavy out-migration of constituents from the city; third, the effort by aldermen, often long-time incumbents, to attain boundaries that at least preserved much of their population base if not existing geography and fourth, the mayor's late but decisive moves in rewarding allies and punishing opponents.

The events were framed by Chicago's 2010 Census returns. The population recovery of the 1990s had been savagely reversed, as the city's 7% population decline in the 2000s made it the only of the top 10 US cities to lose population. This population loss occurred disproportionately in African American neighbourhoods: more than 150,000 left for the suburbs or other metropolitan areas to escape crime and economic decline. At the same time, Hispanic political leaders saw an opportunity to finally reverse decades of representation-lagging population gains, especially because the few areas of the city to gain population outside of the central business district were heavily Latino.

Whatever the political environment, a redistricting effort in Chicago must conform to basic parameters beyond the VRA. State law requires 'compactness' in ward boundaries and that the 50 wards be of 'nearly equal proportions'[8] (Amdur 1974). However, Chicago is exempt from some of Illinois' stricter requirements on council elections by the so-called 'Chicago Little Charter' from the Revised Cities and Villages Act of 1941,[9] with the result that requirements elsewhere for two-

member wards and council size-city population matching do not apply. Chicago redistricting was also affected by case law arising from the large volume of litigation over remapping. The city's 5 November 1970 redistricting – conducted to comply with a 1968 court order but before racial data from the 1970 census were available – caused widespread anger and ultimately a series of lawsuits over attempts to protect white aldermen (including Ald. Ed Burke-14th, still on the council today after 46 years) from demographic change, culminating in *Cousins v. City Council of City of Chicago*.[10] On an appeal, this case has resulted in a narrow decision affecting only two wards, and proved to be minor compared to the events following the 1980 and 1990 censuses, which radically altered Chicago politics.

The 1980 redistricting in Illinois was tumultuous at every level of government; the state legislative map became the first one in a non-Confederate state to be successfully litigated; the Congressional map was drawn by judges; a 1982 constitutional referendum spearheaded by future governor Pat Quinn, the Cutback Amendment, threw out the state's longstanding multi-member legislative districts and reduced the size of the general assembly by a third and the Chicago city map was overturned after four years by a landmark case (*Ketchum v. Byrne*), that ordered special elections in redrawn wards which finally gave Harold Washington, the city's first African American mayor, effective control of the city council after nearly three years of the so-called 'Council Wars' (Colman and Brody 1988). The original city map from 1981, based largely on one drawn in private by city planning commissioner Martin Murphy and former Alderman, city council finance committee chair and federal inmate Thomas Keane (Colman and Brody 1988, 503), had heavily shorted Hispanic wards and also produced one less African American majority ward than the census implied.

Nor did the 1990 redistricting go much more smoothly. This time, the council deadlocked and was unable to produce the required 40 of 50 votes for any of the available remapping options. Ultimately, two maps were put to the voters in a March 1992 referendum, the Daley administration's preferred map and an alternative. The Daley-endorsed map won, but further litigation,[11] costing the city of Chicago $20 million, resulted six years later in a federal appeals court decision which ordered another mid-term redistricting that converted one ward to an African American-majority but ruled that the 1992 map had adequately represented Hispanics.[12] Meanwhile, state legislative Republicans, who gained control of congressional redistricting on a drawing of lots, conceived the 'earmuff' district, the 4th Congressional District, which put both northwest side Puerto Ricans and southwest side Mexican-Americans in the same Hispanic majority VRA district wrapping around a large African America majority area on the city's West Side. It was in the context that the 2000 redistricting – the only one of the past 50 years to be conducted in an environment of growing population – went forward with hardly a hitch, an agreed-upon map without litigation.

With this historical background and the huge population losses in the 2000s on the South and West sides of Chicago, it is hardly surprising that African American aldermen went into the 2011 redistricting highly organised. They held their own public hearings, gathered $1 million to fund a successful legal

strategy spearheaded by a former Black Caucus alderman Freddrenna Lyle,[13] and even presented an opening offer that would have heavily packed white gentrifiers into the traditionally working class Daley powerbase 11th ward in Bridgeport.[14] Despite a decline of 182,000 African Americans, lowering their proportion of the city population to 31%, they ultimately attained 18 majority seats, or 36% of the council. This was integrated into the overall plan pushed by long-time alderman Dick Mell-33rd in one of his last major actions on the city council.

Meanwhile, two other subplots were in progress, and both combined for the eight dissenting votes against the approved plan. The first was a product of the steady decline of white residents on the city's southwest side, where powerful aldermen Ed Burke-14th, the long-time finance committee chair, and Marty Quinn-13th, the protégé of and ward representative for State House Speaker Michael Madigan, were eyeing white voters in the district of Mike Zalewski-23rd, the only current alderman of Polish ancestry, to shore up their own electorates.[15] Zelewski's Garfield Ridge-based ward was ultimately carved up for appendages to the Burke and Quinn wards, though ultimately not enough to threaten his re-election. The second subplot saw Fioretti's demise and hostile boundary changes as Mayor Emanuel, late in the process, intervened to break the deadlock and reward political allies. African American aldermen, concerned early in the process about Emanuel's lack of engagement,[16] saw the mayor intervene on their behalf.[17] An attempt by Fioretti, progressive and Hispanic allies, and even some administration loyalists to thwart this plan failed.[18] Economically vibrant parts of Fioretti's 2nd ward appended to the 3rd and 4th wards to compensate for the huge population losses there, leaving a sufficient proportion of African American voters to exceed 50% and ensure the re-elections of incumbents' Will Burns-4th and Pat Dowell-3rd, while freshman alderman and administration opponent Nick Sposato-36th saw his ward become majority-Hispanic with 80% new residents.[19] Meanwhile, the new 2nd ward sits on the opposite side of central Chicago, with an Emanuel ally representing it after the 2015 elections.

Chicago is a strong candidate for testing measurements of gerrymandering in a non-partisan environment due to the high degree of polarisation on other issues, especially relating to race, incumbency and demographic change. The creative license Chicago has employed within the apparent limitations of Illinois law (and the relatively lenient application of that law by the courts) adds a further element of interest. And, the overall complexity of the situation and relatively large size of the city council add further elements supporting more formal assessments of legislative mapmaking and gerrymandering.

Research questions and method

Employing the rudimentary definitional approach of the Supreme Court discussed in the introduction, we see clear evidence of gerrymandering in the bizarre shapes of Chicago's wards, shown in the panel B of Figure 1. Compared with the ward map of approximately 55 years ago (panel A), the differences are striking. The

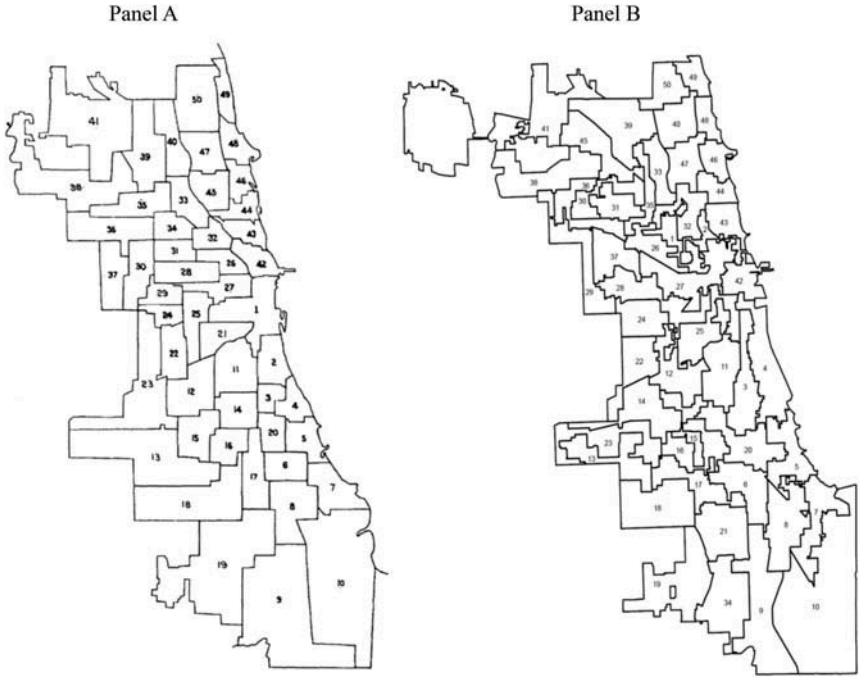

Figure 1. Chicago ward map *circa* 1960 (Panel A) and effective 2015 (Panel B)
Source: Kasperson (1965) and authors' calculations. *Economic Geography* © 1965 Clark University.

initial task here is to define and quantify gerrymandering, subscribing to a geometric approach consistent with Gillman (2002) and Monmonier (2001). This will allow us to quantify the irregularity of ward boundaries and thus reduce the level of subjectivity in the analysis. Most importantly, we will be able to assess the connection between highly irregular districting, the 'cracking and packing' of racially homogeneous groups, the status of aldermen with high or low administrative support scores and the underlying demographic change in the city.

The notion of gerrymandering inherently challenges the democratic ideal. When representative districts are strewn out, twisted and wrapped around each other to such an extent that there is virtually no chance that they are proportionally representative or naturally-occurring communities of interest – that is ones based on functionally proximal rather than arbitrarily 'assembled/constructed' constituencies (Venkatesh 2001) – we expect gerrymandering is at work (Monmonier 2001). At the same time, gerrymandering can 'pack' like-minded citizens together in order to increase vote concentration, yielding a tactic for affirmative action vis-à-vis electoral representation if the packed citizens had previously been disenfranchised. Conversely, gerrymandering can 'crack' homogeneous groups of citizens and thus dilute their vote. Does density of a particular population corresponds to a less compact/contiguous ward? How do concentrations of certain races compare

under pre- and post-redistricting? Specifically, is there balance in how races are represented across all wards, which would be an indicator of cracking, or are races concentrated at the poles, which would be an indicator of packing?[20]

The method we use to measure the extent and intensity of gerrymandering focuses on studying not only the irregularity of a district but also how much it has changed since the last election. The January 2012 evisceration of Alderman Bob Fioretti's 2nd ward, the historic home of long-time African American alderman and later congressman William Dawson and recently transformed beyond recognition by one of the most intense processes of gentrification in the United States,[21] demonstrated two things. First, inter-ethnic politics are a key part of Chicago redistricting, and Fioretti was essentially collateral damage in a broader attempt to maintain African American representation in the face of steep population declines, in contrast to the many decades of African American underrepresentation on the council. Second, moving a ward's boundaries, largely or in this case entirely, can become a potent political weapon on its own and is therefore more than worth measuring. In some cases, the increasingly complex ward boundaries in parts of the city undergoing intense demographic change contrast sharply with the more straightforward boundaries in more stable parts of Chicago; in other cases, notably in the complete migration of the 2nd ward or the reach of the 14th ward into Garfield Ridge, they serve as means to penalise leadership opponents or reward powerful loyalists, respectively.

The geometric approach we employ is in line with Gillman (2002), Monmonier (2001), Altman, MacDonald, and McDonald (2005) and Altman and McDonald (2010), and we use geographic information system (GIS) mapping technology in order to accurately identify areas of demographic commonality among Chicago's population.[22] The first step when employing a geometric approach using GIS visualisation is to analyse shape files of the city's ward boundaries for the pre- and post-redistricting eras. Gerrymandering can be geometrically measured on ordinal scales of spatial compactness and contiguity as indicated by M_1 and M_3, respectively, in Gillman (2002).[23] Specifically, M_1 calculates the ratio of an area of a district, A, to the area of a circle with the same perimeter, P, as that of the district. This comparison of actual area to maximal area that can be captured within the same perimeter length produces a measure ranging over the interval from zero to one (i.e. a circle receives a score of one), shown by

$$M_{1i} = \frac{4\pi A_i}{P_i}, \tag{1}$$

for ward i. It is not a perfect approximation of gerrymandering, and we supplement it with a second measure, M_3, which measures the circumcircle ratio. This is the ratio of the area of a district, A, to the area of the smallest circumcircle of the district, A_c. In other words,

$$M_{3i} = \frac{A_i}{A_c} \tag{2}$$

for ward *i*. (Two of Gillman's (2002) measures, M_2 and M_4, have been ignored here because each was respectively redundant or too esoteric to easily discuss in this forum.)

This approach generates a continuous measure of compactness and contiguity. Therefore, rather than determine and classify gerrymandering in a categorical, binary sense, we can measure it as it relates to other wards, including neighbourhood wards that may have been manipulated in order to achieve a particular result for the target ward. These measures are presented across all 50 wards for the 2015 ward boundaries in Figure 2, where we see only a handful of wards reflecting high degrees of compactness and contiguity.

Our main methodological innovation builds on these measures by not simply flagging suspiciously drawn boundaries but measuring the degree of change from previous redistricting.[24] This is a vital part of the analysis in order to track changes to the status quo, or attempts to maintain the status quo in the face of large-scale demographic change, and also because increased compactness or contiguity on its own does not necessarily mean less gerrymandering (O'Loughlin 1982). Therefore, we build on Gilman's measure (2002) with what we term area shift measure, A_s, which represents the amount by which a district moves overall regardless of compactness or dispersion. It is calculated by outlining the geometric union, *U*, of both old and new districts, subtracting their intersection, *I*, and dividing by the union. Thus,

$$A_{si} = \frac{U_i - I_i}{U_i} \tag{3}$$

for ward *i*. Area shift measures the degree of geographical instability of a ward's boundaries, and we can infer from large shifts at least the possibility of gerrymandering, as significant boundary shifts would be inconsistent with the ambient level of population/demographic change but, rather, as an artifice of one or more aldermen's manifest political interests. This is especially likely in the event of such mapmaking occurring in relatively prosperous and/or demographically healthy parts of the city. We can expect that this occurred for the 2nd, 32nd and 36th wards (and elsewhere), whose aldermen all voted against the redistricting plan and conveyed a track record of relatively low support for the Emanuel administration. As we have already explained in the case study of the 2011–2012 redistricting in Chicago above, they appear to have been penalised with significant area shifts of their wards in the map which was ultimately presented by Emanuel to the city council for a full vote.

We attempt to not only determine which wards show signs of gerrymandering in an absolute sense, but also to show how the redistricting efforts in early 2012 (effective in 2015) may have wrought further change to existing patterns of gerrymandering by possibly rewarding administration supporters or penalising

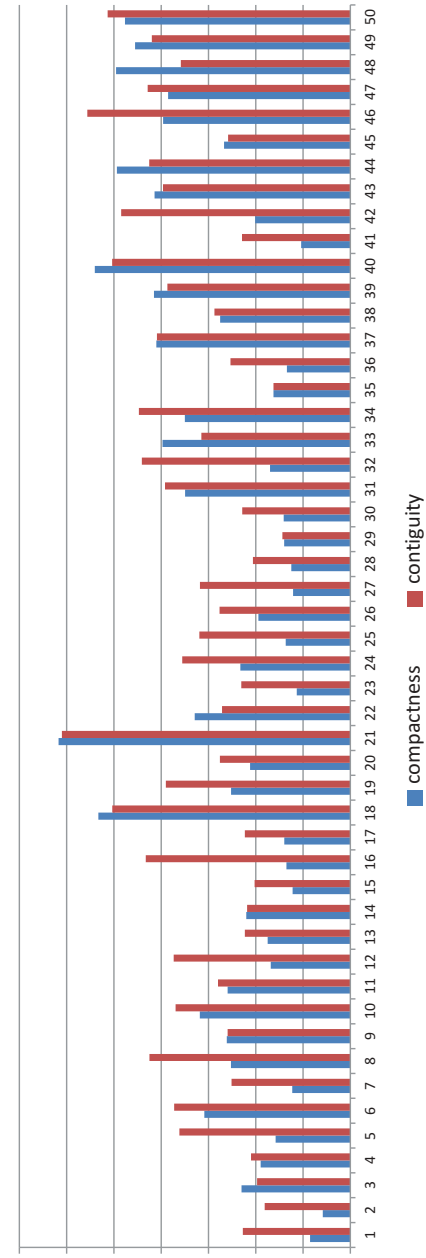

Figure 2. Ward compactness and contiguity measures, 2015 ward boundaries
Note: Greater *y*-axis values indicate greater compactness/contiguity.

opponents. An administration supporter in a neighbourhood demonstrating rapid demographic churn and economic instability may receive ward lines that attempt to minimise that churn and follow existing constituents or at least people who have something in common with those constituents; an administrative opponent in a prosperous and growing part of the city will almost certainly find his or her lines severely scrambled or even unrecognisable. The key component is change, down as well as up. Thus, an M_1 or M_3 score that is significantly low in a single time period is just as significant as a score that has decreased over an observed interval. In both instances, we can infer greater likelihood of gerrymandering because it defies the assumption that representative districts will, along with their respective communities of interest, be geographically proximal in formation (e.g. based on a neighbourhood as defined by physical barriers or other factors such as a half-mile walking radius) and therefore naturally tend toward compactness rather than sprawl.

Shown in Figure 3, there is variance across wards with regard to changes in compactness (M_1) and contiguity (M_3). Our calculations show that both measures tend to increase or decrease together over time. A number of wards stand out in terms of their diminished compactness and contiguity from the post-2000 Census remap (passed in 2001 for the 2003 election) to the remap that takes effect for the 2015 election, (e.g. the 11th, 14th, 15th, 17th and 22nd wards), while a number of others represent increased compactness and contiguity (e.g. the 21st and 46th wards). Several wards also experienced serious area shifts from 2003 to 2015 as a result of the ward remapping project. The 2nd ward, as noted repeatedly above, was entirely relocated; no part of the new 2nd ward boundaries crosses into the old 2nd ward area or even comes within two miles of it. The 15th, 35th and 36th wards also experienced relatively significant area shifts. It should be noted explicitly that aldermen for all of these wards – the 2nd, 15th, 35th and 36th wards – were against the remapping process.[25] The aldermen for these wards also had long-entrenched patterns of relative independence from the administration, belonging to one of the two reform-oriented causes on the council, the Progressive Reform Coalition and the Paul Douglas Alliance.

To assess racial gerrymandering, this article aligns US Decennial Census data with pre- and post-redistricted ward boundaries to determine which races have been cracked or packed. In many cases, as shown in Figure 4 where race has been plotted at the block level for Hispanics, whites, African Americans and Asians, ward boundaries are predicated on racial boundaries, particularly in the West Side (e.g. the 24th, 28th and 37th wards), the North Side (e.g. the 43rd, 44th and 47th wards) and the South Side (e.g. the 6th, 7th, 8th, 9th, 21st and 34th wards). In a number of other cases, wards are clearly dominated by a single race but have segments at the edges which are comprised of other races. Finally, a number of wards are comprised of a mix, albeit not necessarily balanced, of multiple races. The racial composition of each ward for the 2015 ward boundaries (based on 2010 census data) is presented in Figure 5.

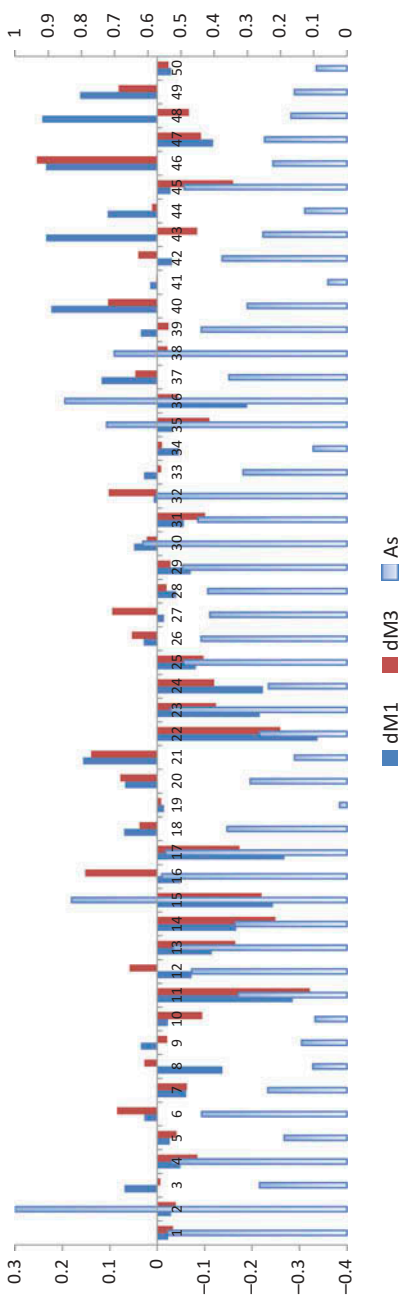

Figure 3. Ward change in compactness (M_1) and contiguity (M_3), left y-axis, and area shift (A_s), right y-axis, from 2000 to 2015

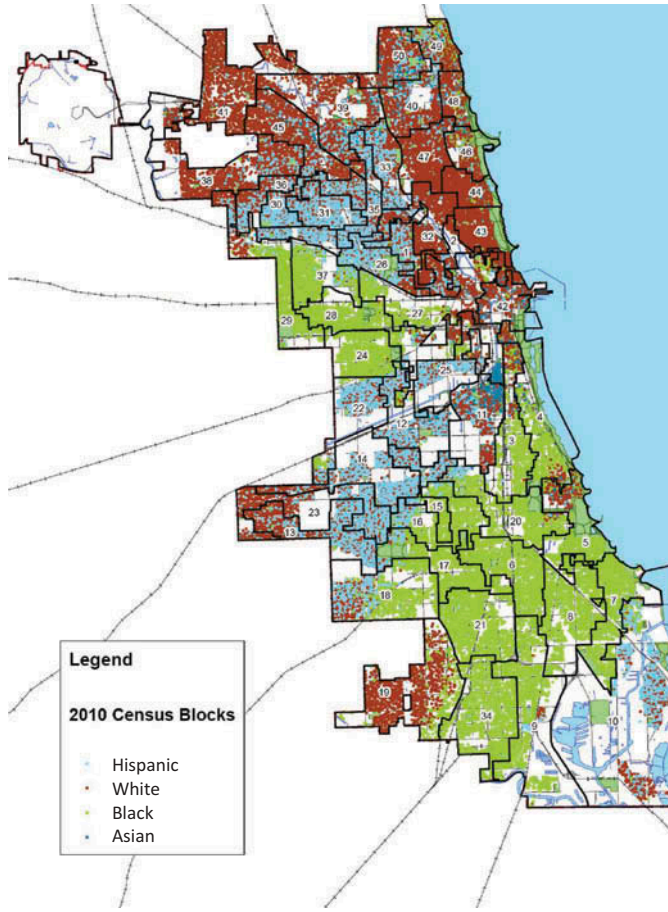

Figure 4. Race (2010 census) and Chicago ward boundaries (effective 2015)

Results

Our first task is to identify the extent to which specific races have shifted within each ward when comparing the new ward boundaries to the old ward boundaries. Presented in Figure 6 for Hispanics, whites and African Americans, there is clear evidence that there has been a significant racial shift in the cases of the 2nd, 5th, 36th and 42nd wards. To compare the proportion shift from 2000 census data for each ward and race and also to compare the mean difference for the proportion shifts under the old boundaries and the new boundaries,[26] two sample *t*-tests for races are conducted. The results of this assessment of whether proportions of each race are significantly different under the old and new ward boundaries, presented in Table 1, show that Hispanics, whites and Asians all experienced declines in the average proportion but that these declines are not significantly

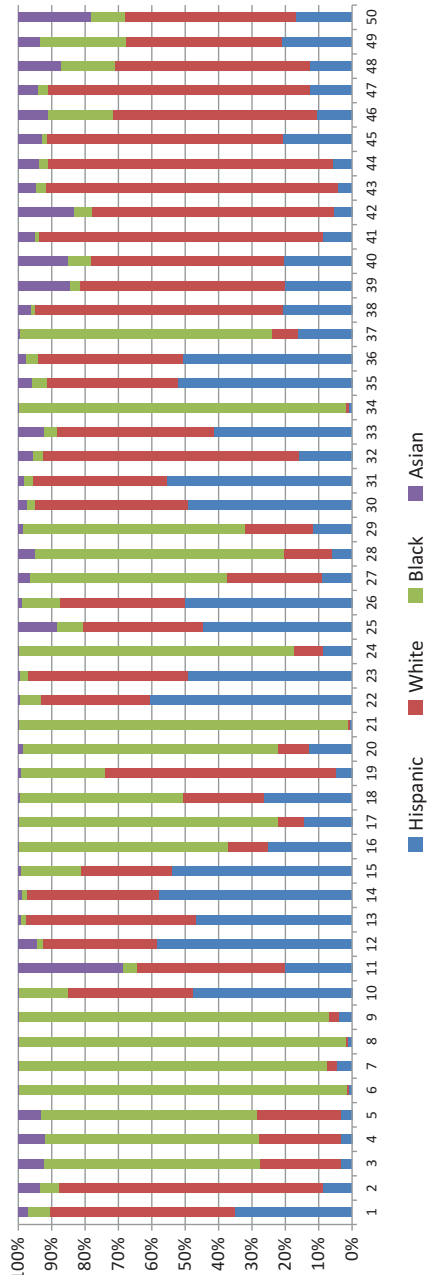

Figure 5. Racial breakdown by Chicago ward boundaries (effective 2015)

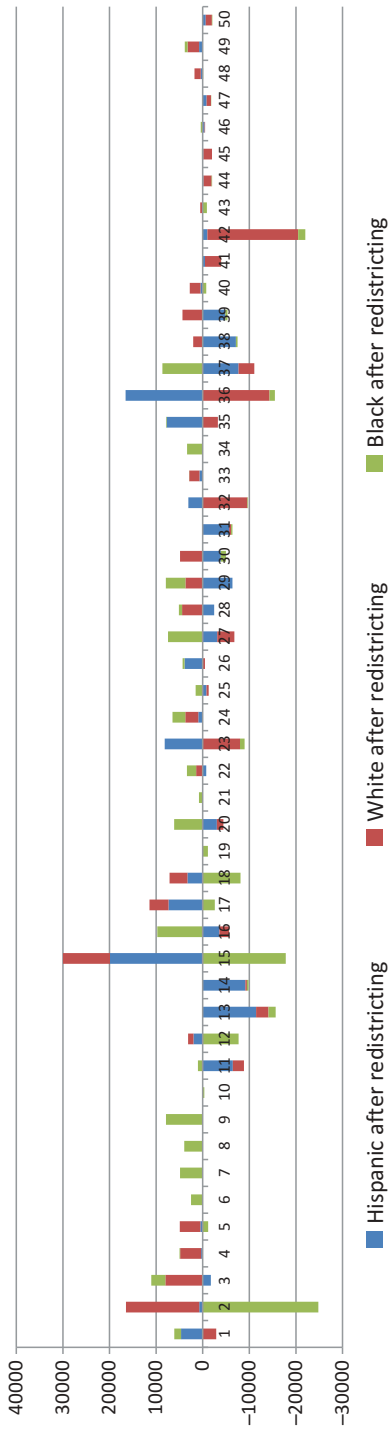

Figure 6. Difference in racial population from old (current) to new (effective 2015) ward boundaries

Table 1. Two-sample *t*-tests for pre- and post-redistricted racial proportions

	Change from 2000 without changed ward boundaries	Change from 2000 with changed ward boundaries	Statistically significant difference ($p < 0.05$)
Hispanic	−0.013	−0.017	No
	(0.011)	(0.017)	
White	−0.117	−0.134	No
	(0.016)	(0.019)	
African American	0.013	0.035	Yes
	(0.007)	(0.016)	
Asian	−0.009	−0.011	No
	(0.002)	(0.003)	

different between the old and new ward districts. The two sample *t*-tests confirm that African Americans alone had significant differences between the old and new ward map, and that under the new map, the proportion of African Americans increased by approximately 3.5%. Under the old map, the proportion of African Americans increased by only 1.3%.

Turning now to the relationship between how changes in our gerrymandering measures predict changes in the average proportion of each race under the redistributed ward boundaries, there are three dependent variables: the change in the proportion of Hispanics from the wards as we knew them in 2000 to the redistricted ward setup, the change in the proportion of whites and the change in the proportion of African Americans.[27] Each model is run twice to avoid multicollinearity problems, once with the change in compactness score (M_1) from 2000 to 2015 and once with the change in contiguity score (M_3) from 2000 to 2015. The OLS regression results presented in Table 2 show that, for the most part, changes in compactness and contiguity are not affecting changes in the proportions of any race. This is likely because any changes in racial proportion from changes in compactness/contiguity are marginal at best given the bizarre

Table 2. Predicting changes in proportion of Hispanics, Whites and African Americans pre- and post-redistricting

Change in...	Hispanics	Hispanics	White	White	African American	African American
	(1)	(2)	(3)	(4)	(5)	(6)
Compactness	−0.247*		0.019		0.011	
	(0.130)		(0.152)		(0.116)	
Contiguity		−0.209		−0.172		(0.064)
		(0.153)		(0.175)		(0.135)
Area shift	0.176**	0.204**	0.236**	0.218**	−0.250***	−0.247***
	(0.078)	(0.077)	(0.092)	(0.088)	(0.070)	(0.068)
F	6.22***	5.18***	3.52**	4.07**	7.03***	7.17***
R^2	0.209	0.180	0.130	0.147	0.230	0.233
N	50	50	50	50	50	50

Notes: $p <$ * 0.10, ** 0.05, ***0.01.

shapes of our current (2000) ward boundaries. Our area shift measure, however, is a strong predictor of fluctuations in racial proportions. In terms of predicting changes from an area shift, the proportions of Hispanics and whites increase while that of African Americans decreases. However, predominantly African American wards have not been cracked in the latest map so much as augmented. Given that African Americans still account for a substantial proportion of the city council given their population drop, several possible factors emerge which are consistent with the case study of the 2011–2012 redistricting process presented earlier: the high proportion of voting for Rahm Emanuel for mayor in African American wards; the long tradition of machine politicians' support for successive Democratic organisation-dominated administrations; the rewards distributed to those African American aldermen for their support; the relative lack of churn with other racial groups in the predominantly African American neighbourhoods of the city and the extent to which the African American population is more segregated than other racial groups – limiting opportunities for creating multi-ethnic wards.

Building on this point, we examine changes in racial breakdown within each ward. Using the 2010 census data, presented in Figure 7 is a comparison of the proportions of Hispanics, whites and African Americans under old ward boundaries with, respectively, the proportions of Hispanics, whites and African Americans under new ward boundaries. The results of this comparison show packing occurring for Hispanics and African Americans in the sense that there are fewer wards around the 50% mark under redistricting than without redistricting. This is especially apparent for African Americans, who have no ward-based proportions between 30 and 55%. Hispanics, as well, have proportions in the 30 to 60% range in only three wards. It is likely that the intense segregation patterns in Chicago, particularly with regard to African Americans, militate against evenly balanced racial distributions, so shifts toward racial proportions in the 50–60% range rather than the more typical 80–90% range is, in itself, evidence of some creative mapmaking.

Discussion

In combination, the GIS-based analysis and the case study of the 2011–2012 redistricting process presented above confirm the following: 1) ward shapes became even more distorted with the post-2010 remap than in the previous one; 2) the numbers of African Americans decreased significantly in two wards while the average proportion of African Americans increased overall despite a loss of 180,000 African Americans from 2000 to 2010 and 3) Hispanics and African Americans (and African Americans especially) are less represented in mixed wards when comparing the 2000 to the 2015 ward maps. This is based on a general pattern of factional gerrymandering, where dissidents in the redistricting process tended to be penalised: the 2nd ward's representative population shifted from African American to white, the 15th ward's shifted from African American to Hispanic, the 23rd ward's shifted from white to

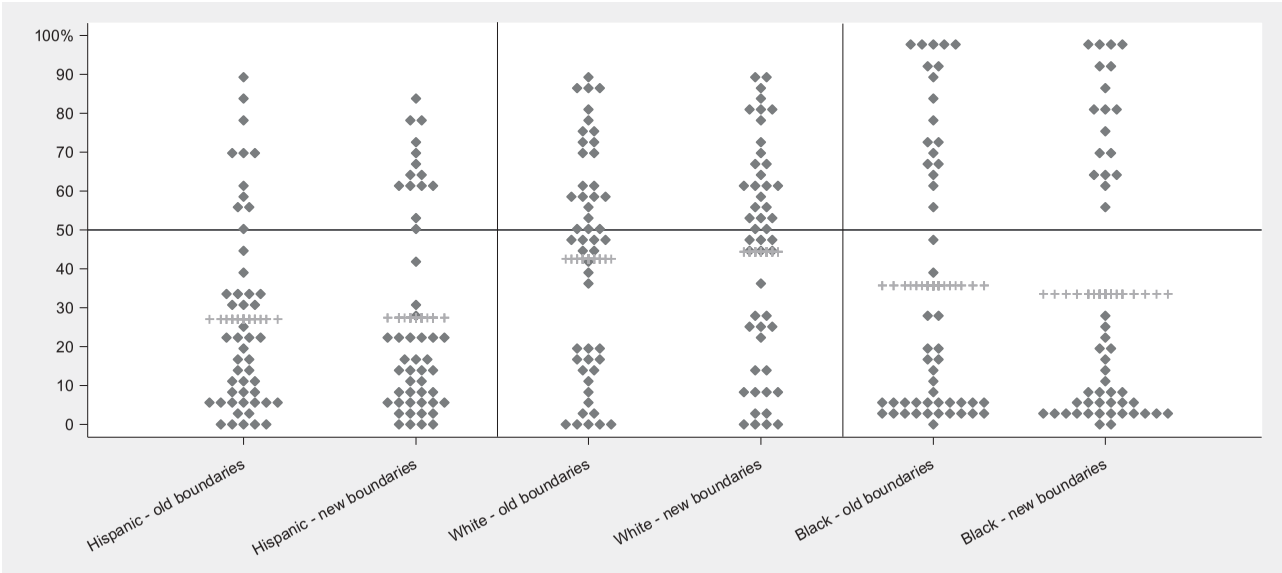

Figure 7. Racial proportions in each ward under old and new boundaries using 2010 census data
Note: Each diamond represents one ward; plus signs ('+') indicate the mean value.

Hispanic and the 36th ward's shifted from white to Hispanic. Despite the formal ending of the system of patronage in Chicago, there is clear evidence that certain wards were given preference over others in the remapping process. Such preferences have ultimately led to disparities in ward populations under the new ward boundaries – the primary argument made in a suit filed by the Chicago League of Women Voters against the City Council – and subsequent claims that the 'one person, one vote' principle of the VRA has been challenged (Briffault 1993). Furthermore, and with regard to the 2015 Chicago elections, Mayor Emanuel was able to secure his re-election with 57% of the vote in black-majority wards,[28] and 18 and 13 aldermanic seats were secured by, respectively, African Americans and Hispanics. These accurately reflect the racial proportions illustrated in Figure 7.

While gerrymandering is still unresolved normatively speaking, the fact that it exists at all can have negative implications for public participation in elections and even policy making.[29] That said, this article does not address the intricacies of single member districts or voting preferences.[30] Yet, the approach presented above contributes to the existing literature on racial gerrymandering by offering a highly appropriate groundwork for matching up potentially gerrymandered districts with expected changes in voting outcomes, namely concentration or dilution of voting strength for a particular racial group. We are fortunate that the Chicago case provides such a rich context but note that a mixed methods approach, such as that offered above, is not always required. It is also entirely appropriate to recognise that our emphasis on race is but a proxy for non-partisan measures that can possibly affect redistricting; religion, access to public space and distribution of business districts are all possible factors impacting how politicians redraw districts in which they are currently serving. Future research can pursue these new avenues of research where applicable.

For Chicago in particular, our area shift approach is politically and institutionally significant given the extent to which day-to-day business – street cleaning, building permits, zoning – is devolved to aldermen. Wholesale relocating of a ward in Chicago is more than simply changing electoral lines; it could impact a great deal of service provision as well. There are, thus, huge potential gains for certain aldermen to capture certain neighbourhoods, huge potential losses for certain neighbourhoods to be shuffled around as pawns and a more severe impact for aldermen who lose a lot of familiar turf. As such, area shifting is going to be particularly important in cities like Chicago that devolve a lot to individual aldermen or any other political entity that devolves a lot to their legislators.

Future research must also continue to use GIS mapping techniques to assess what happens particularly during the ward redistricting process along the most potential controversial areas of the city. To this end, we can either focus on those areas in the wards which have the greatest change in compactness and contiguity or ignore ward boundaries and focus on areas of the city which are less racially homogeneous. These are not mutually exclusive, as it is precisely along these areas that, under racial gerrymandering, redistricting is likely to occur.

Acknowledgements

The authors would like to recognise the data collection and curation efforts of W. David Work, as well as the IIT College of Sciences' Summer Research Award program.

Disclosure statement

No potential conflict of interest was reported by the authors.

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Notes

1. See Venkatesh (2001) and Owens (2012) for details about such communities specifically in Chicago.
2. Note that reports on City Council behaviour have missed the extent to which Ald. Bob Fioretti (2nd) had been voting against the administration for several years, such as Studenkov (2012).
3. See Engstrom and Wildgen (1977) for documentation of such violations.
4. This approach has been attempted for other analyses of city-based gerrymandering, such as Engstrom and Wildgen (1977) study of racial gerrymandering in New Orleans.
5. Chicago's black-white dissimilarity score is 75.9, where a score greater than 60 indicates 'very high segregation' (Logan and Stults 2011).
6. This is distinct from the system of political patronage that was severely weakened until the Shakman ruling, the details of which are presented in detail in Johnson (1988).
7. Inabilities to properly identify these communities have led to deficiencies in how aldermen represent their constituents (Zhang 2011).
8. See Ill. Rev. State ch. 24 sec. 21–36 (1973) as originally passed, now part of 65 ILCS 20/21-36.
9. See 65 ILCS 21, 20-36.
10. See *Cousins v. City Council of City of Chicago*, Civ. A. No. 70 C 3202, 322 F.Supp 428 (1971) in particular the sections at 322 F.Supp 431 and 322 F.Supp 432.
11. See *Bonilla v. City Council of City of Chicago*, No. 92 C 2666, 809 F.Supp 590 (1992).
12. See *Barnett v. City of Chicago*, 141 F.3d 699, 705 (7th Cir.), on remand, 17 F.Supp. 753 (N.D.Ill. 1998)
13. *Source*: Fran Spelman, 'Dispute over boundaries could get ugly: Black caucus hits Lyle in ward fight', *Chicago Sun-Times*, 2 August 2011.

14. *Source*: Fran Spielman 'Black Caucus map hits Daley's 11th ward', *Chicago Sun-Times*, 8 December 2011, page 13.
15. *Source*: Joe Boyle, 'Zalewski Opposes New Remap: Alderman Says Latest Versions are Ripping Apart 23rd Ward.' *Southwest News Herald*, 20 January 2012.
16. *Source*: Kristen Mack and Hal Dardick, 'Message to Emanuel: Black aldermen not happy with remap', *Chicago Tribune*, 2 December 2011.
17. *Source*: Greg Hinz, 'City ward remap takes turn toward the bizarre', *Crain's Chicago Business*, 14 December 2011.
18. See City of Chicago, Legislative Information Center; Ordinance 2011-10252. Accessed at https://chicago.legistar.com/LegislationDetail.aspx?ID=1020581&GUID=F4D2D0BC-22DF-4AC2-8810-220F6188325D&Options=Advanced&Search.
19. *Source*: Charles Thomas, 'Aldermen still hammering out details of new ward map,' *ABC7 Eyewitness News*, 14 December 2011.
20. The latter would be consistent with Marschall, Ruhil, and Sha (2010) findings as well as the high degree of racial segregation in Chicago.
21. Dawson, for many years by far the most significant African American politician in Chicago, and an often reluctant agent of Mayor Richard J. Daley's machine in his later years (Grimshaw 1992), served as second ward alderman from 1933 to 1939, second ward Democratic committeeman from 1939 until his death in 1971 and member of Congress from 1946 to 1971.
22. This runs counter to arguments for redefining representative contiguity to allow for virtual proximity through such innovations as telecommunications or transportation infrastructure, as in North Carolina's 12th Congressional District, often referred to as the 'I-85 District' (Monmonier 2001: 154). This may pass muster in certain such cases where state legislators can justifiably connect separate but demographically similar population centres strung out along an interstate corridor or waterfront, but in the smaller-scale context of municipal/urban representation, this is not sufficiently reasonable. Yet, for example and with regard to the Chicago case, the Dan Ryan Expressway forms an obvious geographic barrier between Bridgeport and Bronzeville/Canaryville (or the 11th and 3rd wards, respectively), and it is reasonable to expect different demographic characteristics to cluster on each side of the divide.
23. See Polsby and Popper (1991, 1993) and Taylor (1973) for less technical descriptions.
24. The use of multiple compactness scores is consistent with Niemi et al. (1990) work.
25. There are also notable cases, such as the 23rd, 32nd and 45th wards, that experience large area shifts and voted against redistricting. It should also be noted that the alderman for the 15th ward was absent for the vote.
26. This article opted to use proportions (and changes in proportions) as key measures vis-à-vis raw population numbers, which are less indicative of dominance by a single race or balance among multiple races.
27. In other words, the proportion measure is the racial proportion after redistricting minus the racial proportion before redistricting but using 2000 census data.
28. *Source*: http://www.wbez.org/news/politics/black-vote-proves-key-chicago-mayoral-race-111844.
29. At the state level, this does not appear to be the case (Masket, Winburn, and Wright 2012).
30. It is worth noting that gerrymandering affects our understanding of individual voting losses; that is there is no clear evidence of a negative effect of gerrymandering until the group of which the individual is a member has been disenfranchised to a certain degree (Gerken 2001).

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