Political Geography 57 (2017) 1–12

Contents lists available at ScienceDirect

Political Geography

journal homepage: www.elsevier.com/locate/polgeo

Components of partisan bias originating from single-member districts in multi-party systems: An application to Mexico☆

Eric Magar [a, *], Alejandro Trelles [b], Micah Altman [c], Michael P. McDonald [d]

[a] Instituto Tecnológico Autónomo de México, Mexico
[b] University of Pittsburgh, USA
[c] Massachusetts Institute of Technology, USA
[d] University of Florida, USA

ARTICLE INFO

Article history:
Received 11 January 2016
Received in revised form
16 November 2016
Accepted 29 November 2016
Available online 13 December 2016

Keywords:
Redistricting
Partisan bias
Malapportionment
Gerrymandering
Voter turnout
Mexican congressional elections

ABSTRACT

We extend the estimation of the components of partisan bias—i.e., undue advantage conferred to some party in the conversion of votes into legislative seats—to single-member district systems in the presence of multiple parties. Extant methods to estimate the contributions to partisan bias from malapportionment, boundary delimitations, and turnout are limited to two-party competition. In order to assess the spatial dimension of multi-party elections, we propose an empirical procedure combining three existing approaches: a separation method (Grofman et al. 1997), a multi-party estimation method (King 1990), and Monte Carlo simulations of national elections (Linzer, 2012). We apply the proposed method to the study of recent national lower chamber elections in Mexico. Analysis uncovers systematic turnout-based bias in favor of the former hegemonic ruling party that has been offset by district geography substantively helping one or both other major parties.

A fundamental function of representative democracy is the conversion of parties' electoral support into legislative representation (Lijphart, 1994). Often, scholars measure the quality of representation by examining the difference between the vote share that a party receives in the electorate and the seat share it subsequently wins in elections to the legislature. The congruence of vote shares with seat shares is at the heart of electoral reform debates. This relationship has received much attention from political scientists, economists, sociologists, geographers, mathematicians, and statisticians—in the context of electoral systems that utilize single-member, plurality-win districts and that operate within party systems where competition is limited to two major political parties.[1]

The standard approach to study votes-seats curves focuses on two characteristics: responsiveness and partisan bias (King & Browning, 1987; Tufte, 1973). *Responsiveness* measures how seats change in relation to votes, or the slope of the votes-seats curve. In a perfect proportional representation (PR) system, a party would receive a seat share equal to its vote share—and responsiveness would equal one (Linzer, 2012; Taagepera & Shugart, 1989). For many reasons, responsiveness is rarely equal to one—even in PR systems, thresholds to win a seat preclude a smooth translation of votes into seats. In district systems, responsiveness deviates further from PR because of how voters are assigned to geographical units. In the extreme, when every district is perfectly competitive between the parties, a small change in votes yields a large change in

☆ We are grateful to Jonathan Slapin, conference participants at the University of Houston, seminar attendees at the University of Florida, workshop members of the Political Economy of Social Choices workshop, Casa Matemática Oaxaca, at CIDE, and ITAM for comments and critiques; to Drew Linzer and Javier Márquez for guidance with their computer code; and to IFE's Cartography Department for sharing their experience with automated redistricting since 1996 and most of the data we analyze. The first author would like to acknowledge the support of Asociación Mexicana de Cultura AC, of Conacyt, and of Washington University in St Louis, where he was visiting scholar when a good part of this paper was written. Mistakes and omissions are the authors' responsibility.

* Corresponding author. ITAM Depto de Ciencia Política, Río Hondo 1, Col Tizapán San Angel, Del Alvaro Obregón, DF 01000, Mexico.
E-mail addresses: emagar@itam.mx (E. Magar), lat44@pitt.edu (A. Trelles), escience@mit.edu (M. Altman), Michael.mcdonald@ufl.edu (M.P. McDonald).

[1] See Altman and McDonald (2011), Balinski and Young (2001), Brady and Grofman (1991), Cain (1985), Cox and Katz (2002), Engstrom (2006), Erikson (1972), Gelman and King (1994), Grofman (1983), Grofman, Koetzle and Brunell (1997), Gudgin and Taylor (1980), Johnston (2002), Kendall and Stuart (1950), King and Browning (1987), Niemi and Fett (1986), Rae (1967), Rossiter, Johnston and Pattie (1997), Taagepera (1973), Trelles and Martínez (2012), Tufte (1973).

http://dx.doi.org/10.1016/j.polgeo.2016.11.015
0962-6298/

seats, or high responsiveness. If every district is perfectly uncompetitive, seat shares are largely unaffected by vote shares, and responsiveness is near zero. In two-party systems, responsiveness can be described as a symmetric distortion of the seats to votes curve, in the sense that a party wins seats at the expense of their opposition (Grofman & King, 2008). In contrast, *partisan bias* introduces an asymmetry in the votes-seats relationship. The term "partisan bias" describes an undue advantage in the ability to win legislative seats. A party favored by systematic bias win seats with fewer votes than their opposition, which can lead to counter-majoritarian outcomes when the party winning the most votes fails to win a legislative majority.

Theory highlights three sources of partisan bias. One is *malapportionment*—differences in district populations. A party with stronger voting bases in smaller-population districts receives a seat bonus nationwide (Jackman, 1994; Johnston, 2002). Another is *distributional*, and is often associated with partisan gerrymandering—the practice of strategically drawing district boundaries to achieve partisan bias. Partisan gerrymandering strategies involve wasting an opposition party's votes by either packing their supporters into a few districts they win by overwhelming majorities or spreading them thin across several districts that they cannot win (Cox & Katz, 2002; Engstrom, 2006; Owen & Grofman, 1988). Distributional distortions may occur through the intentional practice of gerrymandering, or unintentionally through the confluence of geography and the rules governing the drawing of district boundaries. The third source is *difference in turnout* across districts. A party enjoying stronger support in high-turnout districts pays a seat penalty relative to opposition parties that do well in low-turnout districts; the latter parties win seats with fewer votes (Campbell, 1996; Rosenstone & Hansen, 1993).

We explore the independent contribution of these three sources of partisan bias in multi-party systems. Our method to achieve this builds upon work by Grofman et al. (1997). Our contribution is three-fold. First, unlike Grofman, Koetzle and Brunell (and unlike previous works—see footnote 1), our approach drops the restrictive assumption of two-party competition. National two-party systems remain exceptional even among plurality systems (Cox, 1997), so extending measurement to multi-party competition clears the way to test theoretical propositions using empirical data from numerous systems previously beyond reach. Second, we take often-ignored "creeping malapportionment" (Johnston, 2002) into account. Malapportionment is most-often described as a deliberate choice to overrepresent citizens residing in small-population districts and underrepresent those in large population districts. Creeping malapportionment—notably prevalent in the United States prior to Supreme Court decisions in the 1960s—arises by the failure to redistrict using the most current population counts from a government census. Third, we apply these advancements to examine Mexican lower-chamber federal legislative elections to assess our method in a multi-party setting. Since democratizing in the second half of the 1990s, three major parties routinely win most votes, but up to 11 parties have fielded candidates for the Cámara de Diputados. We uncover small, but systematic, partisan bias against the right relative to the country's former hegemonic ruling party, but especially relative to the left. Decomposition of bias into the three additive components reveals that the parts are often greater than the whole, contributing in opposing directions and, therefore, offsetting one another to a large extent.

The comparative study of electoral systems has stressed the measurement of disproportionality (Lijphart, 1994). Breaking this measure into the system's responsiveness and partisan bias takes the inquiry one step further—but, so far, for two-party competition only. Our method widens the scope. The measurement and analysis of partisan bias in simple plurality, single-member district systems with multi-party competition, such as Canada, India, and the present-day United Kingdom, will place the United States and classic Britain in comparative perspective. Adding other dimensions of institutional variance, such as runoff elections (as in France), the Alternative Vote (in Australia), or even low-magnitude proportional representation (as in Chile's binominal system or Ireland's Single Transferable Vote) should add further depth to comparative politics.

We proceed as follows. We describe the three models upon which we build our approach in sections 1, 2, and 3. Each model removes obstacles: King (1990) measures partisan bias in multi-party systems; Grofman et al. (1997) breaks down the size and polarity of three independent sources of partisan bias; and Linzer (2012) estimates quantities of interest with a limited number of observation points. Our method stands at the intersection of this trio. The remainder of the paper applies our proposed procedure to a case of substantive interest to students of elections and political geography, in general, and Latin America, in particular. Section 4 describes Mexico's mixed-member electoral system, isolating the plurality tier for analysis. We describe the sources and limits of the data we analyze for five consecutive elections between 2003 and 2015. Section 5 is an examination of substantial creeping malapportionment in these elections. Section 6 reports results. Section 7 concludes with a discussion of the importance to the method for future scholars and practical applications.

Partisan bias in the multi-party context

We begin by formalizing partisan bias and responsiveness. The two-party case (King & Browning, 1987; Taagepera, 1973; Tufte, 1973) extends in a straightforward manner to multi-party competition. In the two-party case, partisan bias and responsiveness are typically conceptualized as a generalization of the cube law stipulating that:

$$\frac{s}{1-s} = e^{\lambda}\left(\frac{v}{1-v}\right)^{\rho} \Leftrightarrow \text{logit}(s) = \lambda + \rho\,\text{logit}(v) \qquad (1)$$

where s is the seat share won by a party with vote share v; λ is the party's bias relative to the opposition party (positive values favor the party, negative values favor the opposition); and ρ is responsiveness. When $\lambda = 0$, a system has no partisan bias. The expression on the right is an algebraic transformation, convenient for estimation. Fig. 1 shows how the parameters affect the votes-seats translation function.

The three centered lines, which intersect at fifty percent of both seats and votes, illustrate how responsiveness can vary without partisan bias. A system with $\rho = 1$ is perfect proportional representation, the ideal type against which electoral systems are often contrasted. PR appears as the dotted diagonal line: every party winning v percent of the vote gets, precisely, $s = v$ percent of seats. As responsiveness grows, the curve becomes steeper, over-representing the winner (points above the diagonal). At the limit, when ρ tends to infinity, every district is a microcosm of the national electorate, such that the party receiving 51% of the vote wins all districts and receives 100% delegates. $\rho = 3$, the dotted line, characterizes the classic cube law that many have associated with plurality rule in single-member districts (Taagepera, 1973). With cube responsiveness, a party with 55% of the vote wins two-thirds of the seats, but with 33% it wins only one-tenth of the seats.

Responsiveness is a symmetric property of the electoral system: *any* party receiving the most votes will tend to accrue a seat bonus, due to responsiveness typically being greater than one. Partisan bias, in contrast, can be defined as *asymmetric* party treatment within the votes-seats function. Gray lines crossing fifty percent