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A number most convenient? The representational consequences of legislative size☆

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ABSTRACT

This paper explores the political representational consequences of the size of democratic legislatures, which it makes the case for viewing as a feature of the electoral system. Focusing on descriptive representation, we argue that larger legislatures facilitate the descriptive representation of traditionally underrepresented groups, and that this effect should be stronger in majoritarian electoral systems. We find support for the hypothesis about the greater impact of legislative (assembly) size in majoritarian systems using a cross-national analysis of women's representation. We then employ a within-case empirical analysis of the descriptive representation of several racial and ethnic minorities and women in (majoritarian) U.S. state legislatures. Support for the hypothesis about the effects of relative legislative size (the ratio of seats to persons) is found for most minorities and women. More mixed but still somewhat supportive findings emerge about absolute legislative size (the raw number of seats).

1. Introduction

In 1860, the size of the U.S. House of Representatives was 237, while in the mid-2000s, the number of seats stood at 435—an almost two-fold increase in almost 150 years. Yet over the same period, a single member of the House has come to represent fifteen times as many people.[1] Numerous popular and scholarly articles have bemoaned this situation (e.g., Conley and Stevens 2011; Harden, 2011; Editorial Board, 2018).

This observed variation in both the raw number of seats, which we call "absolute legislative size," and the size of the legislature relative to the electorate, which we call "relative legislative size," begs the question of: what are the descriptive representational consequences? With notable exceptions, most prominently the body of work that links legislative (assembly) size[2] to party system size (e.g., Taagepera and Shugart 1989; Taagepera 2007; Shugart and Taagepera 2017), legislative size has been ignored by much of the electoral systems literature. Similarly, scholars of descriptive representation have instead focused upon other electoral institutions, such as the existence of quota systems (e.g., Krook 2009). Perhaps the most robust focus on legislative size is found in the American politics literature, at both the state and local levels (e.g., Squire and Hamm 2005; Kjaer et al. 2018; Squire and Moncrief 2020) — yet these are studies with which comparativists do not significantly engage.

In this paper, we attempt to remedy this neglect, arguing that assembly size should be viewed as a feature of the electoral system, one that has effects on descriptive representation. Specifically, we argue that larger legislatures, both those absolutely larger and particularly those where legislators represent relatively fewer people, should deliver better

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[1] While one congressperson represented about 33,000 eligible voters in 1860, by 2006, one congressperson was representing about 500,000.

[2] We use assembly and legislative size interchangeably, reflecting the different terminologies used in different literatures. For example, the comparative literature tends to use "assembly size," but the U.S. state politics literature tends to use "legislative size."

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descriptive representation. We also argue that the effect should be stronger in majoritarian electoral systems. Our empirical strategy is multi-pronged. We first conduct a cross-national analysis of women's representation. We then employ a within-case analysis of the representation of both traditionally underrepresented racial/ethnic groups and women in (majoritarian) state legislatures in the U.S. We find support for the hypothesis about the differential effect of legislative size under proportional and majoritarian electoral systems. We also find relatively strong support for the hypothesis that relatively larger assemblies with fewer constituents per representative produce better descriptive representation, particularly for Blacks and women. The results for absolute legislative size are more mixed, but still somewhat supportive.

2. Literature, theory, and hypotheses: the representational consequences of legislative size?

A large literature in comparative politics explores how political institutions shape descriptive representation. This is because of the importance attached to the "politics of presence," especially in the case of traditionally under-represented or marginalized social groups (e.g., Pitkin 1967; Phillips 1995). To date, great attention has been focused on the electoral system as the political institutional explanatory factor of greatest import. This ranges from the type of system (most basically, the distinction between proportional and majoritarian)[3] to special electoral institutions designed to facilitate the representation of particular groups, such as reserved seats and quota systems (e.g., Rule and Zimmerman 1994; Htun 2004; Jones 2009; Bird 2014). Moreover, scholars have recently drawn attention to how the details of electoral systems, such as the distribution of seats across districts, matter for political representation (e.g., Kedar et al. 2016). Yet assembly size as a variable has received little attention to date, despite the fact that democratic legislatures exhibit stunning variation in size across both space and time.

For example, in the minimally democratic countries identified by Bormann and Golder (2013) from 1946 through 2016, the number of seats in a country's only or lower legislative chamber varies from a minimum of 11 seats in St. Kitts and Nevis to a maximum of 672 in Germany in 1994. Similarly remarkable variation can be found in assemblies at the sub-national level in politically decentralized or federal countries. In the state legislatures of the United States from 1860 to 2019, the number of seats in the only or lower chamber ranges from 21 (Delaware, 1860–1899) to 443 (New Hampshire, 1943–1945). Even more remarkable variation is observed when considering relative legislative size: how many members of a polity's electorate[4] each legislator (seat) can be thought of as representing. As an example, for the most recent election in the minimally democratic countries of Bormann and Golder (Ibid.), the ratio of registered voters (IDEA) to seats ranges from a minimum of about 400 in Nauru to a maximum of almost 1.5 million in India.

Given this empirical variation, it is surprising that legislative size has not played a more prominent role outside of legislative studies in the literature that seeks to link electoral systems to descriptive representation. This perspective is supported by some prominent scholarly works. One such work is Lijphart's classic text (1994). Another is the body of work culminating in Shugart and Taagepera's recent text (2017). In these works, the absolute size of the legislature directly affects electoral disproportionality, which in turn shapes party system size and thereby representation. Descriptive representation is accordingly indirectly shaped by absolute legislative size in these accounts. A smaller literature has argued for a direct linkage. Most prominently placed here is the work of Dahl and Tufte (1973), who classically argued that "the greater the number of constituents per representative, the greater the differences in social characteristics … between representative and constituents" (84). Similarly, in the American politics literature, many advocates of a larger U.S. House have argued that relatively larger legislatures offer myriad representational benefits, including descriptive representational ones (e.g., Harden, 2011).[5]

Yet overall, Rae's classic characterization of legislative size as a "generally neglected variable" (1967, 114–125) still holds today in studies of descriptive representation, given the focus on other political institutions. Further, in many comparative studies of electoral systems and party systems, the focus is on the district magnitude and electoral formulae, with legislative size featuring only indirectly (e.g., Cox 1997; Clark and Golder 2006; Hicken and Stoll 2013; Kedar et al. 2016). The largest focus of the literature exploring the consequences of legislative size has been on non-representational outcomes, such as the size of government — which raises the possibility that there may be a tradeoff between representational benefits and efficiency (e.g., Weingast et al. 1981; Taylor 2006; Chen and Malhotra 2007; Pettersson-Lidbom 2012; Kjaer and Elklit 2014; Bowen 2021).[6] And in the American state politics literature, Squire and Hamm (2005, 49) go so far as to argue that "much more systematic work on the importance of membership size [is] need [ed]."[7]

Moreover, the limited empirical work to date on the direct descriptive representational consequences of assembly size has produced mixed findings and has been primarily conducted at sub-state levels, raising questions of generalizability to more powerful national legislatures. Outside of the U.S., both national level studies (Oakes and Almquist 1993) and local level studies (Kjaer and Elklit 2014) have concluded that descriptive representation for marginalized groups is only weakly improved in larger legislatures. Similarly, the local level findings from the United States range from a positive impact on women's descriptive representation in Alozie and Manganaro (1993), to a negative impact on women's seat share but a positive impact on women's presence (versus absence) in Kellogg et al. (2019), to a significant positive impact only on women's presence in Kjaer et al. (2018). Further, intriguing recent work by Latner et al. (2021) at the municipal level in the United States, Ireland, the Netherlands, and Australia finds a positive relationship between absolute assembly size and the representation of racial minorities, as well as a similar positive finding when the interaction between assembly size and district magnitude is considered.

We accordingly join scholars such as Latner et al. (2021) and propose a renewed focus on how assembly size, as a political institution that can be viewed as a feature of the electoral system, directly shapes descriptive representation. Our basic, first hypothesis is simple: *larger legislatures should lead to better descriptive representation for traditionally underrepresented groups, all else being equal (H1)*. Although we are not the first to make this argument, as discussed above, it has received surprisingly limited empirical attention to date and with surprisingly mixed results, a point echoed by Shugart and Taagepera (2017). Another, more intensive look is therefore warranted, particularly given the relative ease (with respect to controversy and implementation) of increasing legislative size when compared to other reforms. Findings about its effect should therefore be of interest to reformers in the United States and elsewhere

[3] Throughout, we use "majoritarian" as classically defined by Lijphart (1994) and empirically realized by Bormann and Golder (2013) to refer to electoral systems that are relatively restrictive, such as with small average district magnitudes, in contrast to proportional systems.

[4] We focus on the electorate instead of the population because it provides a clearer link to our dependent variable of descriptive representation.

[5] For more works exploring both indirect and direct impacts of assembly size on representation, see, for example, Rae (1967); Taagepera (2007); Frederick (2008, 2010); Farrell (2011); Lundell (2012); and Kjaer and Elklit (2014).

[6] There is also literature that treats assembly size as the dependent variable, e.g., Jacobs and Otjes (2015).

[7] Rather, the literature on the descriptive representation of traditionally underrepresented groups in state legislatures in the United States has focused on factors such as legislative professionalism and the group's share of the population (e.g., Squire and Moncrief 2020).

who are looking for feasible political institutional levers to move descriptive representational outcomes.[8]

The existing literature proposes different mechanisms by which legislative size may impact descriptive representation. We therefore test two versions of our basic hypothesis (H1) that broadly reflect the two different core approaches. First, the more traditional comparative literature, tied to scholars like Dahl and Tufte (1973), Taagepera and Shugart (1989), and Lijphart (1994), proposes that assemblies where members represent a smaller number of constituents (the concept we call the relative assembly size) should produce better democratic representation, both descriptive and substantive. Dahl and Tufte (1973) suggest this mechanism is related to closer ties between voters and their representatives (84–85), while Shugart and Taagepera (2017) point to how smaller population districts create opportunities for both natural and intentional majority-minority districting. We believe both of these are at play. Accordingly, our first, more specific, version of hypothesis of H1 focuses on the *effect of the number of seats relative to the electorate, or relative legislative size, on descriptive representation (H1a)*. We know that a legislator accountable to hundreds of constituents will have a different relationship with those constituents than one accountable to thousands or millions. Surely we therefore expect very different kinds of legislators to choose to run, and accordingly to be elected, in these different scenarios.

Second, in contrast, the literature on women's representation has focused on absolute assembly size. This literature has argued for a tokenism or cohort effect: assemblies with more seats create descriptive representatives that can mollify calls for better representation without actually changing the dynamics of political power (e.g., Alozie and Manganaro 1993). Reflecting this, we also test the *effect of the absolute number of seats, or absolute legislative size, on descriptive representation (H1b)*. We anticipate the relative legislative size to be more important, but testing both is important in light of the appearance of both in the literature.

Existing work also suggests that the impact of assembly size may be mediated by the restrictiveness of the electoral system. In proportional representation systems, we expect legislative size to more mechanically and indirectly affect descriptive representation through its effects on disproportionality and the party system (e.g., Kjaer and Elklit 2014). We expect a more transformative and direct effect in majoritarian systems. In such a setting, legislatures with more seats will generally have districts that are smaller in terms of population, as discussed earlier. This should produce lower stakes political environments with elections that require less campaign infrastructure, less routine campaign activities, and less fundraising, which should increase the likelihood that candidates from non-dominant groups can successfully compete in the electoral arena. Further, for geographically concentrated minority groups, it should also increase the likelihood of their attaining majority status in some districts, which research shows increases the likelihood of descriptive representation (Lublin 2017; Bochsler 2011; Ruedin 2009). All of this should in turn facilitate the supply of candidates from traditionally underrepresented groups such as women (e.g., Lawless and Fox 2005; Bird 2005; Shah 2013; Sorensen and Chen 2021; Kukec 2022). More candidates should, in turn, increase the likelihood of electoral success. Our second hypothesis is therefore: *the more majoritarian (restrictive) the electoral system used to elect the legislature, the greater the positive impact of legislative size on descriptive representation (H2)*.

3. Empirical analysis: cross-national analysis

We begin with a simple cross-national empirical analysis of women's representation in minimally democratic countries. We focus on women's representation as is conventional in the cross-national context because the identity of racial/ethnic minorities varies from country to country (e.g., Rule and Zimmerman 1994).[9]

The dependent variable in our analysis is the percentage of women in the only or lower legislative chamber of the national legislature.[10] Data on the number of women legislators and the number of seats in the lower house is taken from the Inter-Parliamentary Union ("Women in Parliaments," 2015).

Our key independent variable is legislative size, conceptualized and measured in two ways. First is the *relative* size of the lower or only chamber of the legislature (H1a). A natural measure of this concept is to divide the total number of seats in the only or lower legislative chamber by the electorate at the time of the election. We call the resulting statistic the seats-to-persons ratio.[11] For example, a 10-seat assembly in a country with 100 people has a seats-to-persons ratio of 10:100, or 1:10 = 0.10. Larger values signal relatively larger assemblies. To calculate this variable, we take data on the size of each country's registered electorate from International IDEA's Voter Turnout Database, and data on the number of legislative seats from the Inter-Parliamentary Union. The second measure is simply the absolute number of seats (H1b). Our hypotheses predict positive relationships between each of these variables and women's share of national legislators. However, we expect a stronger relationship with the former because the legislature's relative size taps more directly into the theoretical insight that there may be a relationship between how many people legislators typically represent and descriptive representational outcomes.

We control for five other political institutional variables that the comparative literature has related to women's descriptive representation. These variables are: electoral system restrictiveness, operationalized conventionally as the logged average district magnitude (data from Bormann and Golder 2013)[12]; a dummy variable for the use of a mandatory quota system for gender representation (data from the Quota Project, "Gender Quotas Database," 2015); a dummy variable for the use

[8] See, for example, the discussion in the forthcoming Union of Concerned Scientists Task Force report, "Achieving Multi-Racial, Multi-Party Democracy" (https://www.ucsusa.org/resources/achieving-multiracial-multiparty-democracy).

[9] While we expect many politically marginalized communities to benefit from increased legislative size, the hurdles faced by women are more comparable cross-nationally than the often idiosyncratic and case-specific exclusions faced by ethnic, racial, linguistic, religious, and other politically marginalized groups. As such, we instead empirically explore the descriptive representation of ethnic/racial minorities using our within-case analysis of the United States (discussed below), where there are fewer concerns with comparability.

[10] We report the results from the use of a proportional dependent variable with OLS due to the ease of interpretation, in light of the fact that we obtain similar results from logging the dependent variable in the case of relative legislative size, and broadly similar results for absolute legislative size with some minor differences. See the supplemental paper for detailed discussions of these and all other alternative modeling choices.

[11] We use the seats-to-persons ratio instead of the perhaps more easily interpreted persons-to-seat ratio because scatterplots suggest that the persons-to-seat ratio has a non-linear relationship with the dependent variable. The seats-to-persons ratio, its reciprocal, is the linearizing transformation. Our rationale for using the (registered) electorate in the denominator over other alternatives, such as the voting age population or actual turnout, is discussed in the supplemental paper.

[12] The treatment of mixed member systems, which raises a number of issues, is discussed in the supplemental paper. (For example, they — like single member district plurality systems — are operationalized as having a logged average district magnitude of 0, due to their single member district component.) Overall, the results reported are not sensitive to this measurement choice. Specifically, for example, we find similar results for Model 1a from eliminating mixed member proportional systems from the analysis and from alternative operationalizations of electoral system type that focus on the electoral formula, such as a simple dummy variable for proportional systems (list PR, STV, and mixed member proportional). We also find more statistically significant results for Model 1b. This is of particular relevance given the indirect role played by legislative size in the calculation of the average district magnitude.

of a voluntary quota system for gender representation (Ibid.); a dummy variable for the existence of reserved seats for women (Ibid.); and a dummy variable for some kind of presidential regime with a directly elected president (our update of data originally compiled by Hicken and Stoll 2013). Finally, we control for region in order to account for unmeasured regional characteristics (from religious to cultural factors) that might shape women's representation. We do so using a ten-category schema from Bormann and Golder in which industrialized (OECD) countries serve as the omitted baseline category, in comparison to other regions such as Latin America and Eastern Europe. More details about these variables are found in the supplemental paper.

The cases in the analysis constitute a cross-section of legislative sessions following the closest election prior to 2012 in all minimally democratic countries, as identified by Bormann and Golder (2013). This time period is chosen for commensurability with our empirical data on minority representation in the United States (discussed below), as well as issues with data availability in more recent years.[13] There are 117 such legislative sessions, although after deleting cases with missing data, we are left with 114 observations.[14]

3.1. Models, results, and discussion

The models we estimate, labeled Models 1a and 1b, include the variables discussed above, as well as an interaction term between the measures of legislative size and the logged average district magnitude:

$$[\text{Percent Representatives}]_i = \beta_0 + \beta_1[\text{Legislative Size}]_i + \beta_2[\text{Log Average District Magnitude}]_i + \beta_3[\text{Legislative Size} * \text{Log Average District Magnitude}]_i + \beta_4[\text{Mandatory Quota}]_i + \beta_5[\text{Voluntary Quota}]_i + \beta_6[\text{Reserved Seats}]_i + \beta_7[\text{Presidential}]_i + \beta_8[\text{Region}]_i + \varepsilon_i. \quad (1)$$

In Model 1a, legislative size is relative and measured using the seats-to-persons ratio. In Model 1b, legislative size is absolute and measured using the number of seats.

The results of the analysis, with estimation using OLS and robust (White's 1980 heteroskedastic-consistent) standard errors, are displayed in Table 1.

However, the regional dummy variables are not shown in the interests of space (see the supplemental paper).

We see from Model 1a that the effect of relative legislative size is conditional upon the restrictiveness of the electoral system, as H2 hypothesizes. The interaction term between the seats-to-persons ratio and the logged average district magnitude is statistically significant ($p = 0.046$, two-sided test).[15] Moreover, with the interaction term being negatively signed while the relative legislative size main effect term is positively signed, the interpretation is that relative legislative size has the largest positive marginal effect in restrictive electoral systems (Brambor et al. 2006)—an effect that diminishes the less restrictive (i.e., the more proportional) the electoral system becomes. Fig. 1 shows these estimated marginal effects, including a rug plot illustrating the empirical distribution of cases along the horizontal (X) axis.[16]

Further, in the most restrictive electoral systems (those with single member electoral districts), the effect of the maximal observed increase in relative legislative size is substantively significant: around 14 percentage points holding all else constant, even though this effect falls short of conventional levels of statistical significance (if not by much: $p = 0.12$). We accordingly find at least suggestive support for our hypotheses about relative legislative size, at least for majoritarian electoral systems with respect to H1a. More research is needed, however, in light of the small sample size and the observational and cross-sectional nature of the analysis.

Conversely, Model 1b shows that the effect of absolute legislative size is not conditional on the restrictiveness of the electoral system, contrary to H2. The interaction term between the number of seats and the logged average district magnitude does not approach conventional levels of significance. Further, as illustrated in Fig. 1, with both the main effect and interaction terms being negatively signed, legislatures that are larger in terms of their absolute number of seats are always predicted to have a negative (if statistically insignificant) marginal effect on women's descriptive representation in national legislatures, contrary to H1b.[17] However, we note that these findings are consistent with some recent empirical results from local level studies of women's descriptive representation in the United States (e.g., Kellogg et al., 2019).

While we reserve a full discussion of the control variables for the supplemental paper, we note here that all control variables have the expected signs, given the literature's hypotheses.[18] Further, all either attain conventional or close to conventional levels of significance, with the exception of voluntary quotas and reserved seats. For example, in keeping with the expectations derived from the comparative literature, both more proportional systems (at least in Model 1a) and mandatory quotas have meaningful, statistically significant, and positive effects on women's representation. Of note is our finding with regard to presidentialism. While the basic measure of presidentialism used falls short of conventional levels of significance, it does so only barely ($p = 0.08$) in Model 1a. Moreover, the substantive impact of switching from a non-presidential to a presidential regime is non-trivial, resulting in a decrease in women's representation of about 3 percentage points.[19]

4. Empirical analysis: evidence from the United States

We next turn to an exploration of the effects of legislative size on the descriptive representation of racial/ethnic minorities and women in state legislatures in the United States — additional tests of H1a and H1b.

[13] Using a more recent cross-section of elections (the closest election prior to 2017), as identified by the Bormann and Golder (2013) dataset update through 2016 (the most recent at the time of writing), yields similar but more statistically significant results regarding relative legislative size, but some minor differences regarding absolute legislative size. The most significant differences that emerge concern the quota and reserved seat control variables. Missing data on quotas and reserved seats, despite drawing from multiple sources, leaves us with between 107 and 109 cases with this update.

[14] A list of the country-elections used in both analyses are found in the supplemental paper, as are descriptive statistics for all variables and models.

[15] Because our hypotheses are directional, we report one-sided tests throughout in the text unless otherwise noted, although our tables more conservatively report two-sided tests of significance.

[16] Interestingly and counterintuitively from the perspective of our hypothesis if not some empirical results in the literature, the marginal effects turn negative and become statistically significant for a handful of the most extremely proportional electoral systems — a matter for future work to further explore, such as whether the relationship is non-linear.

[17] Controlling for the size of the electorate does not meaningfully affect these results.

[18] A minor exception regarding the electoral system when the legislature is relatively very large (Model 1a) is discussed in the supplemental paper.

[19] See Allen and Stoll (2018) and the supplemental paper for more about the effect of presidentialism. This includes the use of alternative measures, which result in even more significant findings, and an exploration of the mechanism.

Table 1
Estimated coefficients and robust standard errors for the *cross-national models of women's representation* (Models 1a and 1b). The *dependent variable is the women's share of the lower or only national legislative chamber*. The *key independent variable in Model 1a is relative legislative size, operationalized as the seats-to-persons ratio*; the *key independent variable in Model 1b is absolute legislative size, operationalized as the raw number of seats*. Regional dummies not shown in the interests of space. White's heteroskedastic-consistent robust standard errors are reported in parentheses. Significance codes are for two-sided tests, all calculated prior to rounding to two significant digits: 0.01, ***; 0.05, **; 0.10, *.

Dependent Variable: Women's Descriptive Representation, Cross-national	Women	Women
	Model 1a	Model 1b
Intercept	24***	26***
	(3.3)	(4.8)
Log Average District Magnitude	1.6**	1.4
	(0.73)	(1.1)
Mandatory Quota	6.3***	7.0***
	(2.2)	(2.0)
Voluntary Party Quota	3.0	3.8
	(2.6)	(2.5)
Reserved Seats	2.3	1.9
	(4.6)	(4.6)
Presidential	−3.3	−2.8
	(2.4)	(2.4)
Seat-to-persons Ratio	4400	
	(3700)	
Seat-to-persons Ratio* Log Magnitude	−2500**	
	(1300)	
Seats		−0.010
		(0.0093)
Seats * Log Magnitude		−0.0016
		(0.0034)
N	114	115
R2	0.51	0.52
Root MSE	8.4	8.3

There are several reasons for this choice. Employing a single country, within-case analysis holds many potentially confounding cultural and institutional factors constant, while allowing key variables such as the size of the legislature to vary.[20] It also allows us to consider the descriptive representation of minorities, in addition to women. The United States is a good case due to the substantial variation it exhibits at the state level with respect to both legislative size and the descriptive representation of women and minorities. Moreover, given our hypotheses and the findings from our cross-national analysis, U.S. states' use of majoritarian electoral systems enables us to zero in on the empirical impact of legislative size on descriptive representation in majoritarian electoral systems.

We note that it is somewhat of an open empirical question if legislative size will have the same descriptive representational impact on *all* traditionally underrepresented groups. Our analyses of both women and several racial minorities in the United States allow us to explore this issue. To the extent that we find similar effects for women and minorities, our confidence is increased that legislative size is responsible, as opposed to our findings being an artifact of the United States' relatively unique system of electoral districting vis-à-vis racial minorities.

4.1. Minority representation

For the first part of our empirical test of H1a and H1b, we analyze how legislative size affects Black descriptive representation in the lower or only house of U.S. state legislatures[21] over a long historical time period. We then triangulate this analysis with a brief, cross-sectional analysis of how legislative size affects the descriptive representation of three other racial/ethnic minorities in the U.S.: Latinos, Asians, and Native Americans.

4.2. Variables and data

Our primary dependent variable is the percentage of Black state representatives. To calculate this variable, we collected data from both secondary and primary sources on the number of Blacks elected to seats in the lower or only chamber.[22] We then divided this number by the total number of seats in that chamber, data for which is taken from Dubin (2007). The resulting percentage ranges from 0 (which is also the first quartile and the median of the observed data, although the mean is 2.1 percent) to a maximum of 65 percent in South Carolina following the 1872 election.

As before, our key independent variables are our two measures of legislative size. First is relative legislative size (H1a), measured as the seats-to-persons ratio as before. We expect this variable to be positively related to Black descriptive representation, given our hypothesis that relatively larger legislatures will provide better descriptive representation. Data on the number of legislative seats is taken from Dubin (2007), while data on the electorate builds upon that in Stoll (2013).[23] The resulting measure ranges from a minimum of 0.00000304 (California in 2006) to a maximum of 0.00393 (New Hampshire in the early 1870s). Second is the absolute size of the lower or only chamber, meaning the total number of seats itself (H1b). We also expect this variable to have a positive relationship with Black descriptive representation.

Although this is an empirical analysis focused on the effect of legislative size, we incorporate in our models five additional variables that the literature has identified as affecting descriptive representation in the United States and which can be measured for the states and time periods that we analyze. These control variables are: the Black share of the electorate; election year, to account for time effects (such as increased Black representation over time); a dummy variable accounting for the use of single-member districts (as opposed to multi-member districts); a dummy variable for states and elections subject to the Voting Rights Act; and fixed effects for states to account for state-specific effects. For a full accounting of how we expect each of these variables to impact descriptive representation, please see the supplemental paper. We acknowledge that there are other factors linked to the descriptive representation of women and minorities that are omitted from our study for

[20] This is similar to the strategy employed by Kjaer and Elklit (2014). See also Pepinsky (2018) for more on the advantages of such a design.

[21] Our focus is upon the lower chamber of bicameral U.S. state legislatures because the representation of traditionally underrepresented groups in the upper chamber has always, with rare exceptions, either mirrored or lagged behind that in the lower chamber.

[22] To collect this data, we drew upon secondary sources ranging from publications by the Joint Center for Political Economic Studies (such as the National Roster of Black Elected Officials) to the National Conference of State Legislatures to numerous state-specific scholarly studies. These secondary sources were cross-checked and supplemented using primary sources ranging from publications of state legislatures themselves, such as membership rosters and class photos; publications by other state agencies, such as the Texas State Library and Archives Commission; and publications of state legislative Black caucuses. Official state data was privileged over other sources. Where possible, replacements to originally elected members were not counted, but the available data did not always allow for this distinction to be made. See Stoll (2013), who used similar sources to collect related data, for more details.

[23] Details about our modifications to Stoll's (2013) data are found in the supplemental paper.

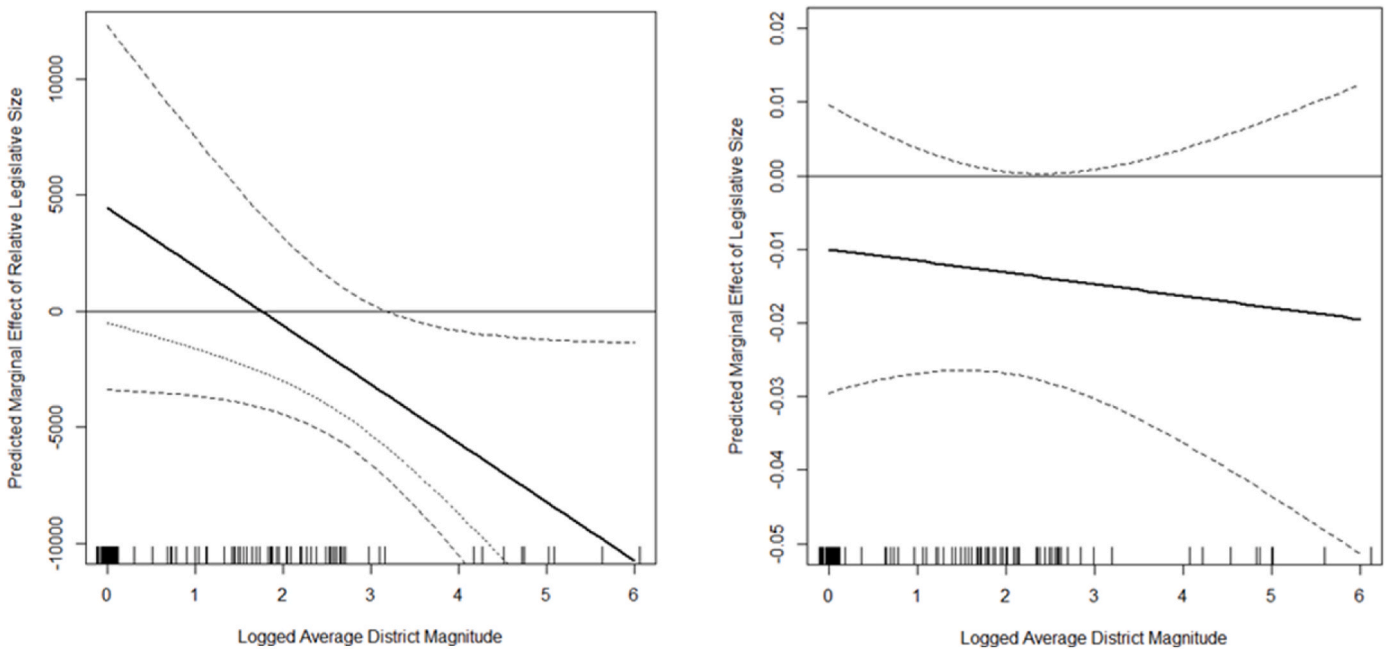

Fig. 1. Predicted marginal effect of legislative size for observed values of logged average district magnitude (Models 1a and 1b). Plot on the left is the marginal effects of relative legislative size (operationalized as the seats-to-persons ratio, Model 1a), and plot on the right is the marginal effects of absolute legislative size (the raw number of seats, Model 1b). 95% two-sided confidence intervals (long dashed lines) band the predicted marginal effects. A 90% one-sided (lower bound) confidence interval (short-dashed line) also bands the predicted marginal effects of relative legislative size.

both theoretical and empirical reasons — an issue that we hope future work will revisit.[24]

The resulting model, which we label Model 2, is as follows, not listing state fixed effects for simplicity:

$$[\text{Percent Representatives}]_{i,t} = \beta_0 + \beta_1[\text{Legislative Size}]_{i,t} + \beta_2[\text{Percent Electorate}]_{i,t} + \beta_3[\text{Year}]_{i,t} + \beta_4[\text{Single} - \text{member Districts}]_{i,t} + \beta_5[\text{Voting Rights Act}]_{i,t} + \varepsilon_{i,t}. \quad (2)$$

We estimate two versions of this model: Model 2a, which uses relative legislative size as the key independent variable to test H1a, and Model 2b, which uses absolute legislative size to test H1b. The cases used to estimate these models are all state legislative sessions of the only or lower chamber resulting from elections between 1860 and 2006. For the 50 states, there are 3492 such sessions. As such, the data structure is time series cross-sectional (TSCS). All variables are fully observed. Our data covers such a long historical period so as to maximize variation in both our dependent variable and our key independent variable of relative legislative size. We begin the data set in 1860 because the Civil War period is often viewed as giving rise to the modern U.S. political system, as well as the lack of variation in both Black descriptive representation and the Black share of the electorate prior to it, which gave way to great variation in its aftermath (such as during Reconstruction, e.g., Foner 2002). We end in 2006 for consistency with our other U.S. state minority analyses (discussed below) and due to the lack of more recent data on Black descriptive representation.[25] Nevertheless, we additionally report versions of Models 2a and 2b estimated from confining the

[24] One such factor from the literature on U.S. state legislatures is legislative professionalization. Unfortunately, longitudinal data on legislative professionalism is only available since the 1970s, and then only as roughly decennial snapshots (e.g., Squire 1992). Moreover, different effects of professionalization have been found for different underrepresented minority groups and women (e.g., Squire 1992; Scola 2014). Another such factor is partisan control. Controlling for this factor is problematic because over the long historical time period that we examine, party affiliations of traditionally underrepresented groups, such as Blacks, have shifted. Similarly, we omit structural and sociodemographic factors (e.g., Kjaer et al., 2018) other than the group's share of the electorate due to the difficulty of obtaining data on these factors for the different groups, time periods, and states that we study.

[25] Presently, comprehensive data on the number of Black and other minority state legislators from 2006 onwards does not exist, with one exception. The Reflective Democracy Campaign (2019) has collected data on the race of state legislators, some of which is probabilistically derived using proprietary models, for 2019. We aggregated this candidate-level data to the state level and ran cross-sectional analyses for Black and the other minority groups studied. We find broadly similar results using this more recent data to those reported here with two exceptions. First, relative legislative size is now predicted to always have a positive effect on Native American descriptive representation, more consistent with H1a. Second, less consistent with H1a, relative legislative size is now predicted to have a negative effect on Black descriptive representation, at least for states with larger Black shares of their electorates. Yet absolute legislative size is now found to have a positive effect on Black descriptive representation, more consistent with H1b (although consistent with the post-1967 results reported here). These findings for Blacks in particular might reflect 2019 being an anomalous year, problems with the updated data (given the probabilistic models used), or a change in the relationship between legislative size and descriptive representation in the last 15 years. Data for additional recent years is needed to distinguish between these possibilities.

analysis to post-1967 legislative sessions.[26]

Yet one might alternatively argue that the effect of an increase in relative legislative size on Black descriptive representation should depend upon the Black share of the electorate.[27] Specifically, legislative size might have a greater impact where and when Blacks constitute a larger share of the electorate. This suggests that, in contrast to Model 2, an interactive instead of an additive specification is needed. It also suggests that the interaction term should be positively signed. Moreover, because we expect the size of the legislature to facilitate Black descriptive representation even when the Black share of the electorate is small, we expect the main effect term on legislative size to be both positive and statistically significant.

To take into account this perspective, we estimate a version of Model 2 in which we interact legislative size with the Black share of the electorate. This model, labeled Model 3, is specified as followed (again not listing state fixed effects):

$$[\text{Percent Representatives}]_{i,t} = \beta_0 + \beta_1[\text{Legislative Size}]_{i,t} + \beta_2[\text{Percent Electorate}]_{i,t} + \beta_3[\text{Seats} - \text{Persons Ratio*Percent Electorate}]_{i,t} + \beta_4[\text{Year}]_{i,t} + \beta_5[\text{Single} - \text{member Districts}]_{i,t} + \beta_6[\text{Voting Rights Act}]_{i,t} + \varepsilon_{i,t}. \quad (3)$$

As before, we estimate two variants of this model: Model 3a with relative legislative size as the key independent variable for testing H1a, and Model 3b with absolute legislative size for testing H1b. The same TSCS set of cases are used to estimate these models.

Last but not least, to triangulate our findings by taking a brief look at other ethnic and racial minorities in the U.S., we estimate versions of Models 2 and 3 for three other prominent minority groups: Latinos (Models 4 and 5), Asians (Models 6 and 7) and Native Americans (Models 8 and 9). As before, two versions of each of these models are estimated: one with relative legislative size on the right-hand side for testing H1a (e.g., Model 4a), and one with absolute legislative size on the right-hand side for testing H1b (e.g., Model 4b). Data on the number of representatives from these minority groups, which we use to calculate the percentage, and the proportion of a state's population belonging to these groups is taken from the Gender and Multicultural Leadership Project (GMCL).[28] However, because this data is only available for 2006,[29] Models 4–9 are cross-sectional instead of time-series cross-sectional. Accordingly, we must drop the year variable and the state fixed effects. In place of the latter, we include dummy variables for region, contrasting the South, North-East, and Midwest with the baseline Western region. All else is as before.

[26] One concern about extending coverage so far back in time is the malapportionment that characterized many state legislative districts from the early 1900s through 1967, when the "reapportionment revolution" sparked by the *Reynolds v. Sims* case of 1964 was complete. Our seats-to-persons ratio effectively functions as an average in this early period, around which there was much variation in the actual number of persons represented by any given legislator in a state. (This is akin to the use of the average district magnitude in the comparative electoral systems literature to capture the "typical" restrictiveness of the electoral system.) As such, we think it captures the overall situation faced by much of the electorate during periods of malapportionment, and especially by Blacks, given the disproportionally favorable representation enjoyed by more rural and white constituencies.

[27] Another possibility, which we leave to future work to explore, is that the relationship is non-linear (e.g., Kjaer and Elklit 2014; see also footnote 16).

[28] We thank Pei-te Lien and her colleagues at the GMCL for this data.

[29] For correspondence with GMCL data, all other data is from the legislative session elected either in 2006 or in the closest preceding state election.

4.3. Results and discussion

Estimation is using ordinary least squares (OLS) regression[30] with robust standard errors.[31] Tables 2a (Models 2a and 3a), 2b (Models 2b and 3b), 3a (Models 4a-9a), and 3b (Models 4b–9b) present the estimated coefficients and standard errors for the U.S. state minority representation models.

Let us begin with our hypothesis about relative legislative size (H1a), and with Blacks. In the additive specification (Model 2a), the sign on the seat-to-persons ratio is positive, meaning as the ratio increases, the share of seats won by Black representatives is predicted to increase. This effect is statistically significant at conventional levels ($p = 0.0$) and substantively significant. For example, increasing the seats-to-persons ratio from its minimum to its maximum observed values (an increase of 0.0039) is predicted to yield an increase in the share of Black representatives of a substantial 12 percentage points on average. A more realistic increase in the seats-to-persons ratio from the 1st to the 3rd quartiles (an increase of 0.00027) is predicted to increase the share of Black representatives by an average of 0.83 percentage points. This may not sound like much, but with Black representatives holding only 2 percent of state lower house seats on average, it is nevertheless a substantial increase. Similar findings are obtained from the model estimated on post-1967 legislative sessions.

Similarly, the interactive model specification (Model 3a) continues to support our hypothesis. Both the interaction term and main effect term of the seats-to-persons ratio are positive and statistically significant at conventional levels ($p = 0.0$). To precisely determine the predicted effect of relative legislative size for this model, we must calculate its marginal effects over the observed range of the conditioning variable, the Black share of the electorate. Fig. 2 shows the marginal effects.

They are always positively signed and statistically significant, providing strong support for the hypothesis. Moreover, because the interaction term is positively signed, the effect of an increase in legislative size is predicted to become larger as the Black share of the electorate increases. Finally, the estimated marginal effects are also substantively significant. Using as our yardstick an increase in the seats-to-persons ratio across the inter-quartile range, the predicted increase in the Black share of state representatives when the corresponding share of the Black electorate is at its observed maximum (57%) is about 8 percentage points on average, a substantial real-world effect. When the Black share of the electorate is instead at its mean (6%), the effect is a smaller but still meaningful increase of 1.6 percentage points on average.

In our brief look at other minority groups, the evidence remains largely supportive of H1a. For Asian and Latinos, the seats-to-persons ratio is statistically significant ($p = 0.024$ for Latinos, $p = 0.0$ for

[30] We again use OLS, despite a proportional dependent variable, because we obtain similar results for the relative legislative size models from alternative approaches, such as logging the dependent variable, a fractional response model, and re-specifying the dependent variable as a binary outcome. The results for the absolute legislative size models are sensitive to these model specification choices, however.

[31] Panel-adjusted Newey-West (Newey and West 1987) standard errors are employed for Models 2 and 3, while White's heteroscedastic-consistent (1980) standard errors are used for Models 4–9. Models 2a and 3a are robust to alternatives, but Models 2b and 3b are not.

Asians) in the expected positive direction in the additive models (Models 4a and 6a). Moreover, the substantive magnitudes are meaningful.[32] The interactive models are more mixed. For Latinos, both the interaction term and main effect term are positively signed (Model 5a), though neither attain conventional levels of significance. The marginal effects, not shown in the interests of space,[33] are all positively signed but only statistically significant for a narrow range of the most common, moderate Latino shares of the population. In contrast, for Asians (Model 7a), the interaction term is negatively signed, of small magnitude, and statistically insignificant. The main effect term, however, remains positive, substantively large, and statistically significant. Further, given the observed range of the Asian population share, the estimated marginal effects are positively signed for all states except Hawaii, a very high outlier,[34] and are statistically significant for the (small) values of the Asian share of the population where most of the observed data lies.

However, the hypothesized effect of relative legislative size is not found for Native Americans. The estimated coefficient on the seats-to-person ratio in additive Model 8a is negatively signed and statistically insignificant, and while in the interactive Model 9a the main effect's sign turns positive, it remains insignificant. Moreover, the interaction term is negatively signed, and the marginal effect is predicted to be negative when the Native American share of the population is more than about 1 percentage point (more than half of the observed cases), contrary to H1a. This contradictory finding may reflect the fact that the Native American and Alaskan Native population is concentrated in a few states and represents a very small proportion in most of the rest.[35] It may alternatively simply be the case that relative assembly size impacts Native Americans differently, given the presence of embedded tribal governments within the United States. Moreover, it is worth noting that the only statistically significant variable in the Native American model is the group's share of the population: none of the other institutional variables seem to matter, either. There is a dearth of empirical research focused on Native Americans, and these results certainly indicate room for further research.

Turning to absolute legislative size (H1b), we find substantially more mixed findings, and hence less support for H1b. Again beginning with Blacks, we now see a negative and statistically significant ($p = 0.038$) effect of an increase in the absolute number of legislative seats in the additive model (Model 2b). In other words, in contrast to the findings for relatively larger assemblies, absolutely larger assemblies are predicted to *decrease* Black descriptive representation. This is similar to the findings from the cross-national women's representation model, as well as to some findings in the literature. Similarly, in the interactive model (Model 3b), both the main effect and interaction terms are negatively signed, and the interaction term is statistically significant. Not surprisingly, the estimated marginal effects (see the supplemental paper) are all negatively signed, but statistically significant over only part of the range (from a Black share of the electorate ranging from about 5% to 35%). However, these findings are sensitive to a variety of alternative specifications, as noted in a number of footnotes above. Most importantly, when confining the analysis to post-1967 legislative sessions, the effect of the number of seats turns positive and becomes statistically significant, supporting H1b.

We find more, but still mixed, support for H1b from the other minority groups. In the additive models (H4b, H6b, H8b), absolute legislative size is found to always have a statistically significant and positive effect, including now for Native Americans. In the interactive models, the marginal effect is always positive for Native Americans and is

Table 2a
Estimated coefficients and robust standard errors for the models comprising the *U.S. state-level analysis with descriptive representation of Blacks (Black's share of state representatives in the lower or only chamber) as the dependent variable and relative legislative size (the seats-to-persons ratio) as the key independent variable* (Models 2a and 3a). State fixed effects are included in all models, but not shown in the table. Newey-West robust standard errors are reported in parentheses for the full time period models, and country-clustered robust standard errors for the post-1967 period model. Significance codes are for two-sided tests, all calculated prior to rounding to two significant digits: 0.01, ***; 0.05, **; 0.10, *.

Dependent Variable: Racial/Ethnic Group Descriptive Representation, U.S. States	Blacks		Blacks
	Model 2a	Model 2a, Post-1967	Model 3a
Intercept	−89***	−200***	−110***
	(4.2)	(67)	(6.0)
Seat-to-persons Ratio	3100***	12,000**	3000***
	(200)	(6000)	(160)
Electorate, % African American	0.26***	0.80***	0.047
	(0.024)	(0.24)	(0.036)
Seat-to-persons Ratio X Electorate, % African American			470***
			(100)
Year	0.043***	0.10***	0.055***
	(0.0021)	(0.034)	(0.0030)
Single-member Districts Only	1.4***	1.8	1.7***
	(0.16)	(1.1)	(0.18)
Subject to Voting Rights Act	4.2***	−1.1	6.7***
	(0.58)	(1.6)	(0.65)
N	3492	967	3492
R2	0.51	0.83	0.56
Root MSE	3.6	2.4	3.4

Table 2b
Estimated coefficients and robust standard errors for the models comprising the *U.S. state-level analysis with descriptive representation of Blacks as the dependent variable (Black's share of state representatives in the lower or only chamber) and absolute legislative size (the raw number of seats) as the key independent variable* (Models 2b and 3b). State fixed effects are included in all models, but not shown in the table. Newey-West robust standard errors are reported in parentheses for the full time period models, and country-clustered robust standard errors for the post-1967 period model. Significance codes are for two-sided tests, all calculated prior to rounding to two significant digits: 0.01, ***; 0.05, **; 0.10, *.

Dependent Variable: Racial/Ethnic Group Descriptive Representation, U.S. States	Blacks		Blacks
	Model 2b	Model 2b, Post-1967	Model 3b
Intercept	−54***	−162***	−56***
	(3.6)	(58)	(3.7)
Number of Seats	−0.0056*	0.020*	−0.0020
	(0.0031)	(0.012)	(0.0022)
Electorate, % African American	0.27***	0.90***	0.42***
	(0.024)	(0.24)	(0.084)
Number of Seats X Electorate, % African American			−0.0013*
			(0.00068)
Year	0.026***	0.081***	0.026***
	(0.0018)	(0.029)	(0.0018)
Single-member Districts Only	1.5***	1.8	1.5***
	(0.17)	(1.1)	(0.17)
Subject to Voting Rights Act	4.6***	−1.5	4.7***
	(0.59)	(1.8)	(0.59)
N	3492		3492
R2	0.49	0.83	0.49
Root MSE	3.6	2.4	3.6

[32] For example, for Latinos, an increase across the interquartile range of the seats-to-persons ratio is predicted to increase the share of Latino representatives by 0.63 percentage points on average. This may not seem like much, but with the median Latino share being only 0.96 percentage points, it is substantively significant.

[33] See the supplemental paper for these and all other marginal effects from the minority representation models.

[34] Excluding Hawaii reduces the statistical and substantive significance in the additive model but increases it in the interactive model. Hawaii is a high outlier because its share of Asian American state legislators (80%) is more than five times higher than the next highest state, California (14%).

[35] However, excluding Alaska, the highest outlier, does not meaningfully affect the results.

Table 3a
Estimated coefficients and robust standard errors for the models comprising the *U.S. state-level analysis with descriptive representation of Latinos (Models 4a and 5a), Asians (Models 6a and 7a), and Native Americans (Models 8a and 9a) as the dependent variable (the group's share of state representatives in the lower or only chamber) and relative legislative size (the seats-to-persons ratio) as the key independent variable.* "West" is the omitted baseline category for region. White's heteroscedastic-consistent robust standard errors are reported in parentheses. Significance codes are for two-sided tests, all calculated prior to rounding to two significant digits: 0.01, ***; 0.05, **; 0.10, *.

Dependent Variable: Racial/Ethnic Group Descriptive Representation, U.S. States	Latinos	Latinos	Asians	Asians	Native Americans	Native Americans
	Model 4a	Model 5a	Model 6a	Model 7a	Model 8a	Model 9a
Intercept	−5.8***	−6.1***	−3.7***	−4.1***	−0.95	−1.2
	(1.8)	(1.6)	(0.73)	(0.82)	(0.61)	(0.64)
Seat-to-persons Ratio	14,000*	4500	11,000***	14,000***	−1500	1400
	(7100)	(5400)	(2400)	(3900)	(1900)	(1700)
Single-member Districts Only	0.044	−0.080	0.70	0.70	0.25	0.18
	(0.71)	(0.81)	(0.51)	(0.51)	(0.37)	(0.36)
Subject to Voting Rights Act	−0.19	0.17	−0.59	−0.50	−0.30	−0.18
	(1.0)	(0.88)	(0.65)	(0.56)	(0.45)	(0.39)
Electorate, % Latino	0.79***	0.70***				
	(0.13)	(0.057)				
Seat-to-persons Ratio X		4400				
Electorate, % Latino		(3000)				
Electorate, % Asian			0.88***	0.97***		
			(0.015)	(0.11)		
Seat-to-persons Ratio X				−1600		
Electorate, % Asian				(2000)		
Electorate, % Native American					0.63***	0.76***
					(0.082)	(0.18)
Seat-to-persons Ratio X						−1800
Electorate, % Native American						(1700)
Midwest	2.3**	2.9**	0.83	0.96	−0.16	0.051
	(1.0)	(1.2)	(0.59)	(0.61)	(0.40)	(0.41)
South	2.1**	2.7**	1.2*	1.3**	0.64	0.64
	(0.98)	(1.1)	(0.66)	(0.67)	(0.58)	(0.52)
Northeast	0.38	0.62	−1.2*	−1.1	0.46	0.44
	(1.1)	(1.3)	(0.68)	(0.72)	(0.42)	(0.39)
N	50	50	50	50	50	50
R2	0.85	0.88	0.98	0.98	0.87	0.88
Root MSE	3.1	2.9	1.5	1.5	0.88	0.86

statistically significant for a moderate range of Native American shares of the electorate (Model 9b). The findings for Asians (Model 7b) are similar to those reported for relative legislative size, while for Latinos (Model 5b), what is different is that the estimated marginal effects turn negative for moderate Latino shares of the electorate and are never statistically significant.

A discussion of the findings about our control variables can be found in the supplemental paper.

4.4. Women's representation

To further test H1a and H1b, we turn to an analysis of women's representation in U.S. state legislatures. This analysis is as analogous as possible to our minority representation analyses.

Our variables are as before, with two exceptions. First, our dependent variable is the percentage of women legislators in the lower or only chamber. We draw this data from the Center for American Women and Politics (CAWP) at Rutgers University. Second, because women's share of the electorate does not substantially vary across geographic regions, we omit the electorate (population) share control variable from the analysis. Note, however, that while both the state legislative electoral system and the VRA control variables remain in the model, our expectations about their effects are different. For the former, evidence from research at the state level points to the fact that women generally benefit from multi-member districts (e.g., Welch and Studlar 1990; Moncrief and Thompson 1992; King 2002), contrary to the case for racial/ethnic minorities.[36] We therefore expect the presence of only single-member districts to diminish women's descriptive representation. With respect to the latter, we are unaware of research that links the VRA to women's political engagement, so we do not expect this variable to have much of an effect.

For correspondence with our Latino, Asian, and Native American analyses, our cases are again a cross-section of state legislative sessions resulting from the 2006 election (or closest preceding election).[37] There are therefore a total of 50 fully-observed cases.

4.5. Models, results, and discussion

We use OLS to estimate two models to explain state-level variation in the percentage of women representatives in state legislatures: the slightly simplified version of Equation (1) described above that we label Model 10, with one version (Model 10a) including the relative legislative size on the right-hand side (H1a), and one version (Model 10b) including the absolute legislative size on the right-hand side (H1b).[38] The estimated coefficients and robust standard errors are found in Table 4.

The results are again supportive of H1a, and this time also supportive of H1b. In Model 10a, the coefficient on the seats-to-persons ratio is found to be positive and statistically significant ($p = 0.035$). As

[36] However, at the local, sub-state level, results have been inconclusive, with some (e.g., Crowder-Meyer et al. 2015) finding single member districts to be more favorable to the descriptive representation of women.

[37] Specifically, we take CAWP data from 2007. We additionally conducted a brief exploratory analysis of the relationship with more recent data: 2015, chosen for comparability with our updated cross-national data. Similarly positive if less significant results are obtained. We hope that future research will draw upon CAWP and other data sources to conduct a longitudinal analysis to more fully explore the empirical relationship over time.

[38] We do not estimate an interactive model because women's share of the electorate does not vary across states. Alternative model specifications do not meaningfully affect the results.

Table 3b
Estimated coefficients and robust standard errors for the models comprising the *U.S. state-level analysis with descriptive representation of Latinos (Models 4b and 5b), Asians (Models 6b and 7b), and Native Americans (Models 8b and 9b) as the dependent variable (the group's share of state representatives in the lower or only chamber) and absolute legislative size (the raw number of seats) as the key independent variable.* "West" is the omitted baseline category for region. White's heteroscedastic-consistent robust standard errors are reported in parentheses. Significance codes are for two-sided tests, all calculated prior to rounding to two significant digits: 0.01, ***; 0.05, **; 0.10, *.

Dependent Variable: Racial/Ethnic Group Descriptive Representation, U.S. States	Latinos	Latinos	Asians	Asians	Native Americans	Native Americans
	Model 4b	Model 5b	Model 6b	Model 7b	Model 8b	Model 9b
Intercept	−4.7***	−6.6**	−3.4***	3.7***	−1.3**	−1.1**
	(1.4)	(2.7)	(0.81)	(0.65)	(0.64)	(0.55)
Number of Seats	0.0089*	0.018	0.0073**	0.023***	0.0030*	0.00019
	(0.0045)	(0.011)	(0.0030)	(0.0050)	(0.0016)	(0.0018)
Single-member Districts Only	−0.30	−0.17	0.41	0.064	0.36	0.38
	(0.64)	(0.73)	(0.60)	(0.41)	(0.40)	(0.41)
Subject to Voting Rights Act	−0.16	0.21	−0.60	−0.61	−0.37	−0.20
	(0.98)	(0.66)	(0.61)	(0.56)	(0.46)	(0.26)
Electorate, % Latino	0.75***	0.97***				
	(0.12)	(0.33)				
Number of Seats X Electorate, % Latino		−0.0021				
		(0.0024)				
Electorate, % Asian			0.88***	1.2***		
			(0.020)	(0.089)		
Number of Seats X Electorate, % Asian				−0.0068***		
				(0.0018)		
Electorate, % Native American					0.63***	0.42***
					(0.082)	(0.10)
Number of Seats X Electorate, % Native American						0.0032
						(0.0019)
Midwest	1.5	2.5**	0.53	0.44	−0.30	−0.37
	(0.95)	(0.98)	(0.66)	(0.64)	(0.43)	(0.44)
South	1.1	2.2*	0.70	0.68	0.53	0.11
	(0.89)	(1.1)	(0.66)	(0.63)	(0.56)	(0.41)
Northeast	0.16	1.1	−1.2	−0.69	0.056	0.0033
	(1.1)	(0.98)	(0.90)	(0.75)	(0.44)	(0.0019)
N	50	50	50	50	50	50
R2	0.84	0.85	0.98	0.98	0.87	0.89
Root MSE	3.2	3.1	1.6	1.3	0.87	0.82

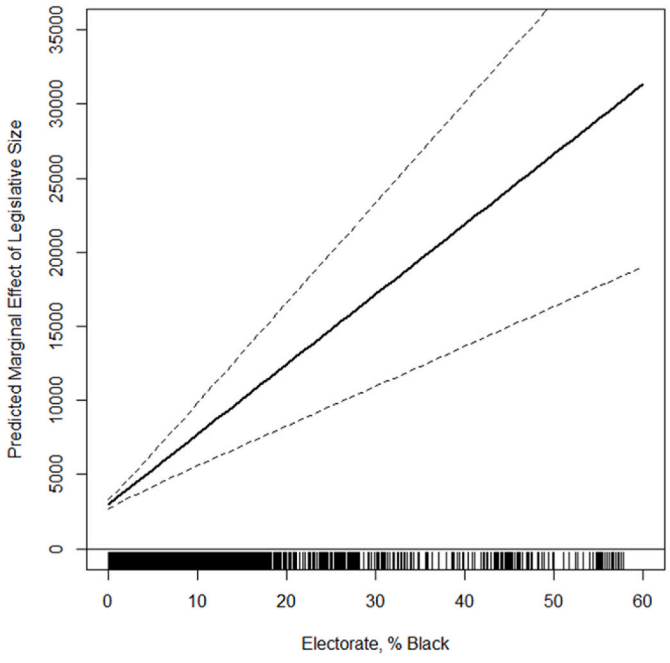

Fig. 2. The estimated marginal effects of relative legislative size (the seats-to-persons ratio) on Black descriptive representation in U.S. state legislatures (Model 3a). Marginal effects are calculated over the observed range of data of the Black share of the theoretical electorate. Two-sided 95% confidence intervals shown as dashed lines.

hypothesized, accordingly, as the number of people represented by one legislator decreases, women's seat share in the lower or only chamber of the state legislature is predicted to increase. To provide an example of the substantive magnitude of the effect, increasing the seats-to-persons ratio from the observed minimum to the observed maximum is predicted to yield an average increase in the percentage of women representatives of 10 percentage points. An increase in the ratio equivalent to its inter-quartile range, by way of contrast, yields a predicted average increase of 1.1 percentage points. Similarly, in Model 10b, the absolute number of seats is predicted to have a positive, statistically significant ($p = 0.0068$), and substantively meaningful effect — one even slightly greater than that found for relative legislative size (e.g., a maximum predicted effect of 12 percentage points).

A discussion of the findings about the control variables is again found in the supplemental paper.

5. Conclusion

We have argued above that the size of the legislature is an electoral system feature that is important for understanding descriptive representation. We focused specifically upon the amount of descriptive representation that traditionally under-represented groups achieve. We first tested our hypothesis that both absolutely and relatively larger assemblies would deliver more descriptive representation comparatively using a cross-sectional analysis of women's representation in minimally democratic country-elections around the globe, controlling for other political institutional factors, and for region. As hypothesized, for relative legislative size, the effect was conditional upon electoral system type, with a reasonably significant positive impact found only in majoritarian systems. However, for absolute legislative size, the effect was less significant, negative, and did not differ significantly across the type of electoral system. We then tested our hypotheses about the effect

Table 4
Estimated coefficients and robust standard errors for the models comprising *the U.S. state-level analysis with descriptive representation of women as the dependent variable* (Model 10). The dependent variable is the women's share of the lower or only state legislative chamber. Relative legislative size (the seats-to-persons ratio) is the key independent variable in Model 10a, and absolute legislative size (the raw number of seats) is the key independent variable in Model 10 b. "West" is the omitted baseline category for region. White's heteroskedastic-consistent robust standard errors are reported in parentheses. Significance codes are for two-sided tests, all calculated prior to rounding to two significant digits: 0.01, ***; 0.05, **; 0.10, *.

Dependent Variable: Women's Descriptive Representation, U.S. States	Women	Women
	Model 10a	Model 10b
Intercept	28***	28***
	(2.2)	(2.1)
Seat-to-persons Ratio	26,000**	
	(11,000)	
Number of Seats		0.032**
		(0.012)
Single-member	0.43	−0.023
Districts Only	(2.2)	(1.9)
Subject to Voting Rights Act	−2.1	−2.3
	(2.3)	(2.2)
Midwest	−7.6***	−8.9***
	(2.1)	(2.0)
South	−9.5***	−11***
	(2.3)	(2.4)
Northeast	−5.1*	−6.6**
	(2.5)	(2.8)
N	50	50
R2	0.38	0.36
Root MSE	6.2	6.3

of assembly size under restrictive (majoritarian) electoral systems using sub-national data from U.S. state legislatures on Black, Latino, Asian American, Native American and women's representation. Supporting evidence for our hypothesis about the effect of relative legislative size was found in most cases: relatively larger legislatures led to higher levels of descriptive representation for most groups. Yet again, evidence was mixed about the effect of absolute legislative size: while the hypothesized positive and significant effect was mostly found, sometimes the effect was negative or insignificant effect.

At a basic level, our findings suggest that legislative size is a political institutional variable that deserves greater attention with respect to descriptive representation. Yet more research is certainly needed. These findings should further launch, not end, the conversation about legislative size. To sketch out a few avenues for future research, we should know more about how assembly size interacts with and compares to the effects of other political institutions, as well as about the causal mechanisms underlying and the generalizability of our findings. For example, future research should pursue studies of sub-national legislatures in other countries and under different electoral systems. Similarly, at the level of U.S. state legislatures, future research should take a closer look at how legislative size and legislative professionalism both interact and compare. It should also undertake longitudinal analyses of the descriptive representation of women and minorities besides Blacks, and examine more recent years. On the latter front, we stress that our empirical findings for each group are limited to the period studied, which does not include potentially transformative recent years. We look forward to data from the last 5–10 years being brought to bear against the hypotheses. Of particular importance, the differential effects of absolute and relative assembly size, and especially the mixed findings about absolute assembly size, need further interrogation. This includes exploring the possibility of non-linearities and digging deeper into direct versus indirect effects under different types of electoral systems. Finally, and perhaps more importantly, future research should explore how the size of the legislature shapes other aspects of political representation besides descriptive representation. We suspect even greater impacts are to be found in the more substantive and symbolic realms.

Nevertheless, this preliminary analysis suggests that there is merit in including legislative size in the constitutional engineering toolkit. This often-neglected feature of the electoral system deserves attention from scholars and reformers alike. This is especially so given the relative ease with which it may be changed. Even if there is no "precise solution" to the "number most convenient for a representative legislature" (to borrow Madison's insight from Federalist No. 55), our findings suggest that many traditionally underrepresented groups are likely to benefit from assemblies that are relatively larger than the ones that are currently in use, at least when a restrictive electoral system is employed. However, reformers interested in expanding descriptive representation will need to balance these benefits against possible efficiency losses, as Kjaer and Elklit (2014) and Squire and Moncrief (2020) persuasively remind us. At minimum, in light of current debates about changes in the size of the legislature in a number of countries, as well as past changes in legislative size over the last twenty years in relatively well-studied democracies such as Germany and Taiwan, it is important for political scientists to develop a better understanding of the potential impacts, representational and otherwise, of such institutional reforms.

Data availability

Data will be made available upon request and posted to the authors' website upon publication.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.electstud.2023.102594.

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