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(Letter) How Gap Measures Determine Results: The Case of
Proportional Systems and the Gender Mobilization Gap.

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Abstract

How scholars conceptualize and measure gender gap in mobilization can have profound consequences for substantive conclusions. Scholars typically refer to a difference between women's and men's turnout (difference-in-proportions measure) or a fraction of women voters among all voters (proportion measure). Using the case of proportional representation (PR) reform in Norway, I demonstrate that, in a context of low men's turnout, the proportion measure indicates that PR narrows the gap, whilst the difference-in-proportion measure indicates that it widens the gap. This is because mobilizing fewer women than men widens the difference between women's and men's turnout, but may constitute a greater proportional increase in women's mobilization compared to men's when only few men (and even fewer women) vote. These findings bring together seemingly opposing arguments in the PR-gap debate and have wide implications for the study of 'gaps' within and beyond gender scholarship.

Keywords: gender gap, turnout, electoral systems, measurements, concepts

Can institutions mitigate barriers to voting of underrepresented groups? Using the case of women at the turn of the twentieth century, I re-investigate the extent to which proportional electoral systems (PR) spur electoral participation of an underrepresented group that faced severe cultural and structural barriers to voting and, subsequently, representation of the groups' interests.

Cutting-edge scholarship suggests that because PR is typically more competitive, it increases elite incentives to mobilize women (Skorge 2023; Teele 2023). Others question the extent to which we can speak of unconditionally positive effects of PR. Kittilson and Schwindt-Bayer (2010, 2012) argue that whether or not PR spurs women's political involvement depends on proportional outcomes, not the system itself. Building on the seminal work of Corder and Wolbrecht (2006, 2016) in the U.S., Morgan-Collins (2023) argues that the overall effects of any electoral system primarily reflect an electoral context in which it operates. In this research, I bring the two perspectives together by shedding light on how scholars define the gender mobilization gap.

Scholars in the PR-gap debate typically measure the mobilization gap either as a difference-in-proportions that identifies the difference between women's and men's turnout (Morgan-Collins 2023; Teele 2023, but also Kittilson and Schwindt-Bayer 2010, 2012 on involvement and Carpenter et al 2018 on social movements) or as a proportion measure that identifies the share of women among voters (Skorge 2023, but also Kim 2019 on direct democracy). Despite the central role of concept formation and operationalization in gender scholarship (e.g. Goerts and Mazur 2008; Krook 2014; Paxton 2000), there has been little discussion about the conceptualization and operationalization of 'gender gaps'.

Using the case of the traditional gender mobilization gap, I expand upon the theoretical framework developed by Morgan-Collins (2023) to demonstrate different sensitivity of gap measures to electoral context. I show that the two measures can produce different insights because one compares women to men using proportions whilst the other using a difference in proportions. This is especially relevant in low salience elections, where a greater number

of men than women is likely to be mobilized by a given phenomenon under study. In this context, the difference-in-proportions measure can indicate a smaller absolute increase in women’s votes compared to men’s whilst the proportion measure can indicate a greater proportional increase.

In order to test my argument, I re-examine a highly studied case that recently spurred substantial debates about the effects of PR (namely Cox et al 2016 on turnout; Morgan-Collins 2023, Skorge 2023, Teele 2023 on women). The Norwegian 1919 reform was implemented in both parliamentary and local elections, which provides a unique opportunity to study two different electoral contexts. I demonstrate that whilst both measures indicate that PR narrowed the gap in parliamentary elections, only the proportion measure indicates that the gap narrowed in local elections. Next, I show that the shift in the gap after PR varies with electoral context, as proxied by pre-reform men’s turnout. Finally, I build on the methodological advances of Skorge (2023) to provide further evidence within a difference-in-difference frameworks that complements Skorge’s original analysis in local elections.

I conclude by proposing that each measure conceptualizes a different aspect of the mobilization gap and therefore provides complementing insights. Highlighting the transferability of the analytical tools developed in this paper, I discuss the generalizability of these findings beyond the PR-gap debate.

Two Measures of the Gender Mobilization Gap.

Scholars in the PR-gap debate operationalize the gender mobilization gap in two different ways. The defining feature of the two measures is whether women are compared to men using proportions or difference in proportions.¹ Table 1 summarizes the two measures.

The proportion measure is calculated as the number of women voters divided by the

¹The two measures used in the PR-gap debate also differ in whether they account for the size of the eligible electorate, although this is not relevant for my argument (see robustness to alternative proportion measures in Appendix Section ‘Alternative Measures’).

Table 1: Two Measures in the PR-Gap Debate

Type	Definition	Operalization	
Proportion	Women’s share among voters	Proportion of votes cast by women among all voters	$\text{votes}_w / (\text{votes}_w + \text{votes}_m)$
Difference-in-Proportions	Difference in Turnout	Percentage point difference between women’s and men’s turnout	$[(\text{votes}_w / \text{eligibles}_w)] * 100 - [(\text{votes}_m / \text{eligibles}_m)] * 100$

Notes: $\text{votes}_{w(m)}$ refers to the number of votes cast by women(men); $\text{eligibles}_{w(m)}$ refers to the number of women(men) eligible electorate.

number of all voters. Values below 0.5 indicate greater mobilization among men (the traditional gap), values above 0.5 indicate greater mobilization among women. In turn, the difference-in-proportions measure is calculated as the percentage point difference between women’s and men’s turnout. Negative values indicate that women’s turnout is lower than men’s (the traditional gap), positive values indicate that women’s turnout is higher. In a context of traditional gap, an increase in either measure indicates narrowing of the gap.

The two measures can sometimes indicate opposite trends. One such example is presented in Table 2. Imagine that out of 200 eligible women and men 10 men and 5 women vote. In this case, women’s share among voters is 0.334 and the difference in turnout is -5 percentage points (t column). Now imagine that the number of voters increases to 25 men and 15 women. In this case, women’s share among voters *increases* to 0.375, whilst the difference in turnout *decreases* to -10 percentage points ($t+1$ column). The two measures indicate an *opposite* trend because the absolute change of voters from one period to the other is lower for women, but the relative change is higher for women. This is because mobilizing fewer women than men can constitute a greater proportional increase for women when there are very few voters.

Table 2: Hypothetical Scenario

	t	t+1	Absolute Change	Relative Change
<i>Eligible Total</i>	200	200		
<i>Eligible Men</i>	100	100		
<i>Eligible Women</i>	100	100		
<i>Voters Total</i>	15	40		
<i>Men Voters</i>	10	25	25-10= 15	15/10= 150%
<i>Women Voters</i>	5	15	15-5 = 10	10/5= 200%
<i>Women's Share Among Voters</i>	5/15=0.334	15/40=0.375		
<i>Gender Turnout Gap (pp)</i>	5-10=-5	15-25=-10		

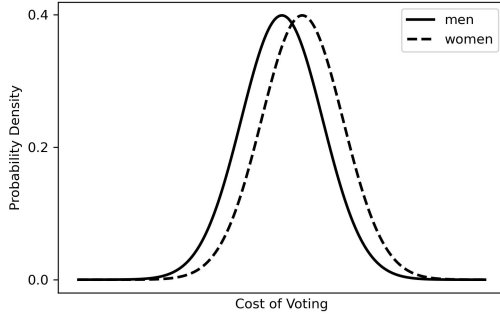
Theorizing Sensitivity of Gap Measures to Electoral Context.

Expanding on the theoretical framework developed by Morgan-Collins (2023), I theorize that the two measures have different sensitivity to electoral context, that is the segment of eligibles that is mobilized by a given phenomena under study. Reflecting on the multitude of gender-based barriers to voting in the context of a traditional gap, it seems reasonable to assume that there are more men than women with low cost of voting. In this context, strengthening the incentives to vote and to mobilize among eligibles spurs men's turnout more than women's (*decreasing* the difference-in-proportion measure). However, the weight of women's votes may still increase (*increasing* the proportion measure). This is because, as demonstrated above, mobilizing fewer women than men may constitute a higher proportional increase among women than men.

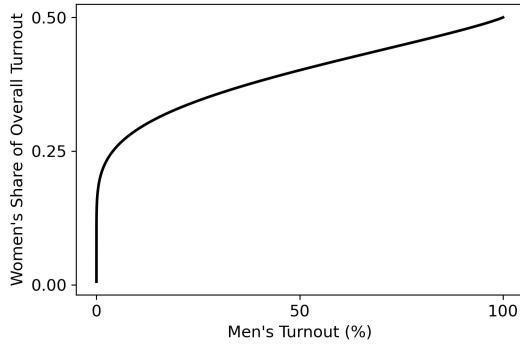
First, I make assumptions about the distribution of women's and men's propensity to vote, as justified and set out by Morgan-Collins (2023) (Figure 1a). I assume that there are the same number of women and men eligibles and that the distribution of women's and men's cost of voting is normal and of the same shape ($\sigma_m^2 = \sigma_w^2$) except that women's mean cost is slightly to the right of men's ($\mu_m < \mu_w$). This seems plausible in a context of severe barriers to voting faced by women. Whilst some women may have low voting costs (e.g. educated upper class women), gendered barriers to voting should reduce the number of such

Figure 1: Predicting Sensitivity of Measures to Electoral Context

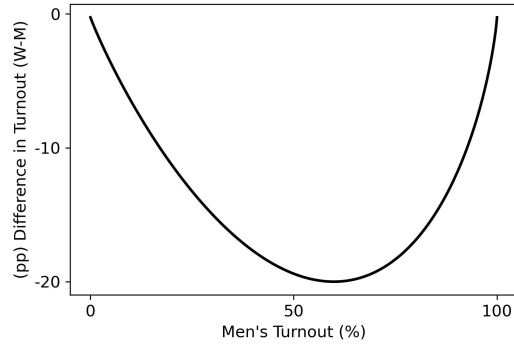
(a) Assumptions



(b) Proportion Measure



(c) Difference-in-Proportion Measure



women compared to low-cost men. Similarly, whilst some men may have high voting costs (e.g. uninformed or non-unionized working-class men), we would expect that there would be fewer such men than women.

Second, I use assumptions made in Figure 1a to predict how the two measures vary with electoral context, proxied by men's turnout (Figures 1b,c). I indicate men's turnout with the cumulative distribution function (CDF) of men's cost of voting (converted to percentages). That is, men's cumulative probabilities indicate the proportion of men falling below a particular 'cut-off' cost of voting that separates voters from non-voters. The difference-in-proportion measure is then obtained by subtracting the CDF of women's cost of voting from the CDF of men's cost of voting (converted to percentage point difference). The proportion measure is obtained by dividing the CDF of women's cost of voting by the CDF of both

women's and men's cost of voting combined. In this example, the figures predict that the proportion measure increases monotonically with men's turnout. In turn, the difference-in-proportions measure decreases and then increases with men's turnout, reaching its widest point when slightly more than half of men votes.²

In order to empirically assess the predictions in Figures 1b,c, I utilize data from pre-reform samples in both parliamentary and local elections. Variable description in Appendix Table A1. Summary statistics and sample descriptions in Appendix Table A2. In order to ease interpretation of the results, I convert proportions (as defined in Table 1) to percentages in all analyses. As theorized, men's turnout has a positive and significant effect ($p < 0.01$) on the proportion measure in both elections (Appendix Table A3, Models 1&2; Appendix Figure A2a for adjusted means). In turn, men's turnout has a U-shaped effect on the difference-in-proportions measure. The quadratic term of men's turnout is significant ($p < 0.01$) in local elections - that is when a substantial number of districts have low men's turnout (Appendix Table A3, Models 3&4; Appendix Figure A2b for adjusted means).

The Effect of PR on Gender Mobilization Gap

The properties of the two measures discussed above have implications for the PR-gap debate. PR typically strengthens the incentives of elites to mobilize and of voters to vote. I argue that whether PR also narrows the gender mobilization gap depends on the gap measure and electoral context. Perhaps the most relevant difference can arise when the segment of eligible electorate mobilized by PR primarily consists of men, as we would expect in the context of a low men's turnout. In this context, the mobilization gap is likely to narrow using the proportion measure, but widen using the difference-in-proportion measure. However, if the segment of eligible electorate mobilized by PR primarily consists of women, as we would

²Of course, these predictions are determined by the assumptions in Figure 1a. Whilst I cannot directly test these assumptions, alternative assumptions are less consistent with my data (see Appendix Section 'Alternative Assumptions' and Appendix Figure A2).

expect in a context of a high men’s turnout, both measures are likely to indicate narrowing of the gap.

In this section, I provide evidence for this argument with two key analyses. In the first analysis, I demonstrate that whether PR is associated with an *overall* shift in gender mobilization gap depends on the measure used in local elections with low men’s turnout. In the second analysis, I demonstrate that the shift in gap after PR can be explained with pre-reform men’s turnout across localities in both local and parliamentary elections. Complementing Skorge (2023), I demonstrate that both of these insights hold in a difference-in-differences setting in local elections.

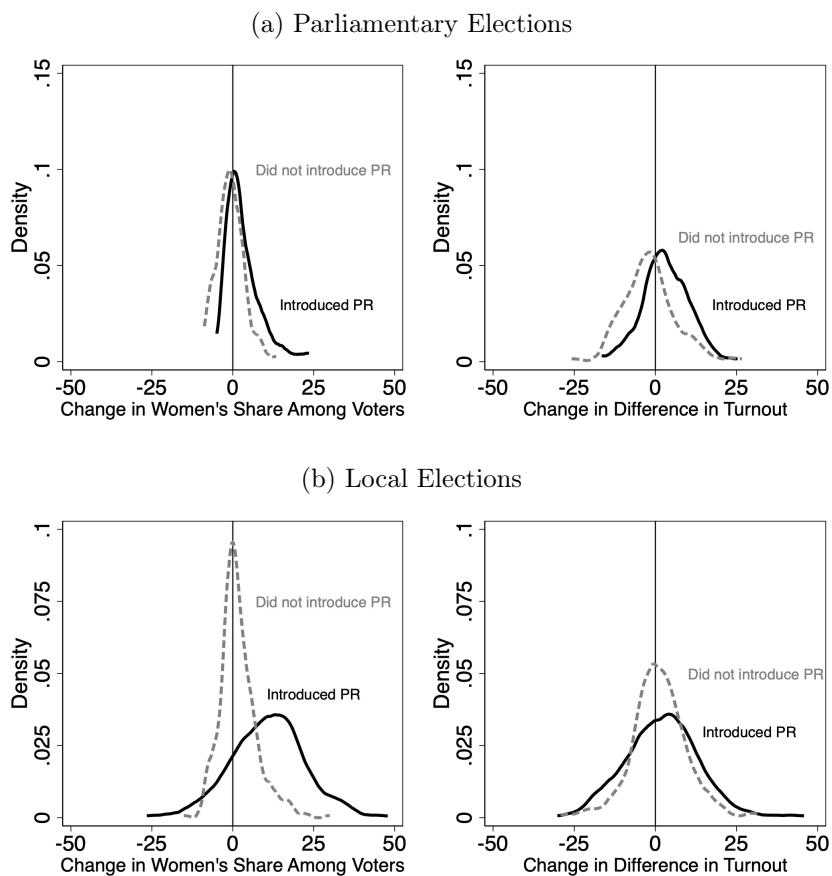
Analysis 1: Documenting a Shift in the Mobilization Gap Before and After PR

Parliamentary Elections. Figure 2a plots kernel densities of change in the gender mobilization gap measures between 1918, the last election before PR, and 1921, the first election after PR. I compare these trends to a control election cycle 1915-1918. The figure shows that the gender gap increased in a majority of pre-reform districts (67.4% and 66.3% using difference-in-proportion and proportion measures respectively, compared to 35.9% and 38.8% in the control cycle). This is consistent with the expectation that the two measures can indicate the same *overall* effect of PR in elections with high pre-reform men’s turnout (Appendix Figure A3a for pre-reform turnout distribution).

Local Elections. Figure 2b plots kernel densities of the change in the gender gap measures between 1916, the last election before PR, and 1919, the first election under PR, in municipalities that introduced PR during this period. I compare these trends to control municipalities that adopted PR before 1916. The figure shows that the proportion measure increased dramatically in municipalities that introduced PR, with the gap narrowing in 84.5% of municipalities (compared to 57% in control municipalities). Whilst the difference-in-proportions measure also narrowed in a majority of municipalities that introduced PR, it *widened* in 41.7% municipalities (compared to 44.9% in control municipalities). This is

consistent with the expectation that the two measures can indicate different *overall* effects of PR in elections with low pre-reform men’s turnout (Appendix Figure A3b for pre-reform turnout distribution).

Figure 2: Kernel Densities of Change in Gender Mobilization Gap



Notes: Sub-figure a) plots kernel density of change in gender gap measures in parliamentary elections; solid (dash) line refers to treated election cycle 1918-1921 (control cycle 1915-1918); unit of analysis is pre-reform district. Sub-figure b) plots kernel density of change in gap measures in local elections 1916-1919; solid (dash) line refers to treated municipalities that introduced PR in 1919 (control municipalities that introduced PR prior to 1919); unit of analysis is a municipality. Redistricted localities between relevant elections excluded.

Difference-in-Differences. I show that the results presented in Figure 2b hold up in a canonical difference-in-difference setting. The causal effect of PR on the mobilization gap in local elections is sizable and statistically significant ($p < 0.01$) when using the proportion measure, but close to zero and not significant at conventional levels using the difference-

in-proportion measure (Appendix Table A5, Models 1-2 for main result, Models 3-4 for robustness; Models 5-6 for pre-treatment placebos; Models 7-8 for replication of Skorge 2023).

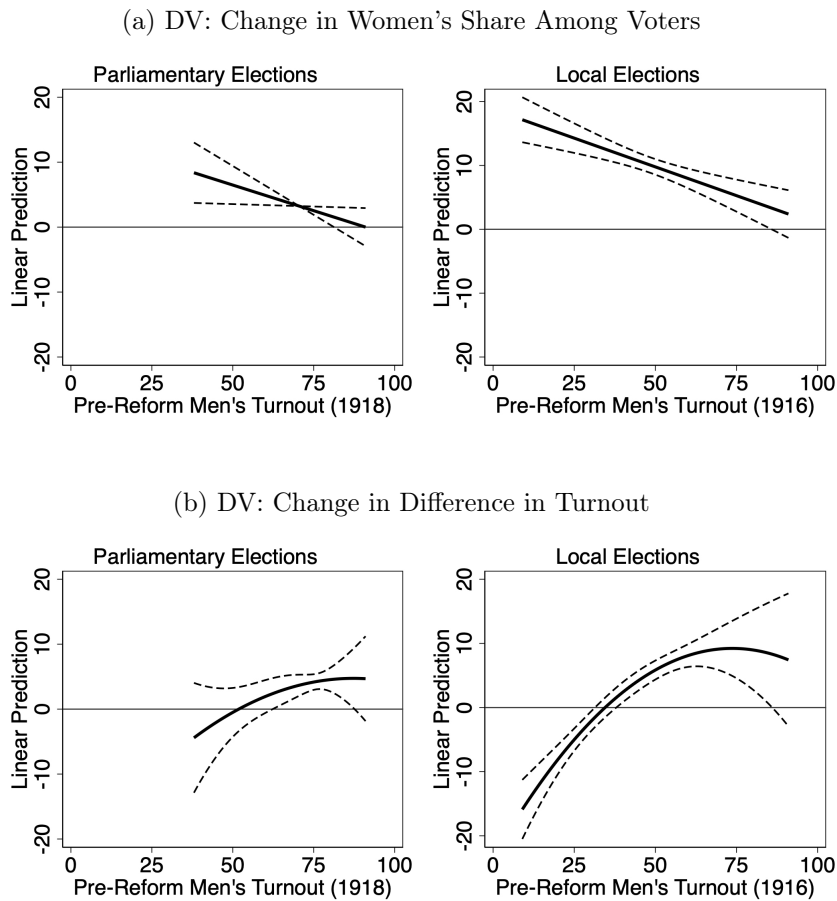
Analysis 2: Explaining the Shift in the Mobilization Gap with Men's Turnout

Proportion Measure. I regress the change in the proportion measure before and after the reform on pre-reform men's turnout. The proportion measure *decreases* with men's turnout in both local and parliamentary elections. The coefficients on men's turnout are negative and statistically significant at 5% level (Models 1&2 in Appendix Table A4). Plotting adjusted means in Figure 3a, we can see that the proportion measure indicates narrowing of the gender mobilization gap at most levels of men's turnout. The negative sign reflects the fact that the incentives to mobilize cannot strengthen any further if pre-reform men's turnout is very high (ceiling effects) and may even decrease. This is consistent with the expectation that the proportion measure can indicate narrowing of the gap after PR as long as pre-reform men's turnout was not already very high.

Difference-in-Proportions Measure. I regress the change in the difference-in-proportions measure before and after the reform on pre-reform men's turnout. In order to account for ceiling effects as above, I add squared pre-reform men's turnout (Models 3&4 in Appendix Table A4). The difference-in-proportions measure *increases* with men's turnout in both parliamentary and local elections, and this increase slows at high levels of men's turnout. The estimated coefficients on men's turnout are significant at 5% level in local elections, but lack significance in parliamentary elections where men's turnout was rarely low. Plotting adjusted means in Figure 3b, we can see that the difference-in-proportions measure indicates widening of the gap when men's turnout is low and narrowing of the gap when men's turnout is high, but not too high. This is consistent with the expectation that whether the difference-in-proportions measure indicates narrowing or widening of the gap depends on context. Whilst PR can spur incentives of women to vote, it may not narrow the difference

between women and men’s turnout, and may sometimes even widen it.

Figure 3: Plotting Adjusted Means of the Change in Gender Mobilization Gap Before and After PR by Pre-Reform Men’s Turnout.



Notes: Full models in Appendix Table A4; 95% CIs.

Difference-in-Differences. The results presented in Figure 3b hold up in a difference-in-difference specification with a treatment-covariate interaction. The interaction between the treatment effect (Post * PR) and pre-reform men’s turnout in local elections is statistically significant ($p=0.001$) (Appendix Table A6, Model 1). Including a squared men’s turnout to account for ceiling effects is not significant at conventional levels ($p=0.113$), but returns patterns that are consistent with the predictions. Plotting heterogeneous treatment effects in Appendix Figure A4 (Model 1), we can see that PR had a *positive* effect on the difference-in-proportion measure in municipalities with pre-reform men’s turnout over 36-

37% and a *negative* effect otherwise. Looking closely at the estimated CIs, these effects are statistically significant for municipalities with men’s turnout above 48% and below 14%. In the model that accounts for ceiling effects (Appendix Figure A4, Model 2), the positive effect of PR is significant when men’s turnout is between about 42% and 75%.

Making Sense of the PR-Gap Debate

The one question that looms large is whether one measure is the ‘right one’. I propose that it is more helpful to think of the two measures as providing complementing information. In line with Adcock and Collier’s (2001) distinction between background and systematized concepts, scholars in the PR-gap debate may be understood as sharing the same background concept (what I call the mobilization gap), but conceptualize it in two different ways. In fact, Skorge (2023) refers to inequality in voting, whilst Morgan-Collins (2023) and Teele (2023) refer to turnout gap. Consistent with this argument is the observation that the two measures are *not* correlated *when* women’s share among voters is low, that is when men’s turnout is also likely to be low (see Appendix Section ‘Discriminant Validation’).

If the two measures conceptualize a different aspect of the same background concept, it is easier to make sense of the conflicting results in the PR-gap debate. Given that the weight of women’s votes is likely to be less dependent on context, using a proportion measure is likely to suggest that PR has an overall ‘positive’ effect on women’s mobilization. Using a difference-in-proportions measure, on the other hand, is likely to suggest that ‘positive’ effects of PR are context-dependent. Given that PR incentivizes elites to mobilize women, these insights suggest that elites may undermobilize women compared to men in PR to an even a greater extent than before the reform. That is, even if PR spurs a greater proportional increase in women’s mobilization, it may widen the difference between women’s and men’s turnout. Only when the two measures are explored in tandem, we can uncover this previously overlooked insight.

Discussion

Through a study of a historical PR reform, this paper demonstrates that whilst PR increases women's turnout, whether or not it also advances gender equality may depend on how we measure women's mobilization relative to men's. Whilst increasing women's turnout is an important precursor to gender equality, the extent of women's participation vis-à-vis men's seems especially relevant in determining the extent of politicians' incentives to mobilize women and therefore women's substantive representation. As women's turnout continues to lag behind men's in a wide variety of contexts (Desposato and Norrander 2009 on Latin America; Robinson and Gottlieb 2021 on Africa; Dassonneville and Kostelka 2021 on secondary elections in the West), the papers' key insights seem relevant for the study of women today.

This paper has implications beyond the PR-gap debate on both substantive and methodological levels. On a substantive level, the paper demonstrates that the effects of institutions that increase mobilization of underrepresented groups (for gender, Cordova and Rangel 2017 on compulsory voting; Corder and Wolbrecht 2006, 2016 on registration; Kim 2017 on direct democracy) may either fail to deliver or even increase the groups' underrepresentation. Even if institutions secure a proportional increase in the groups' mobilization, they may inadvertently also increase the difference in mobilization between the groups.

On a methodological level, this paper offers analytical tools that can guide theoretical considerations of how mobilization gaps are conceptualized and operationalized. Beyond women's mobilization, these tools seem relevant for the study of other undermobilized groups that face greater costs of voting. Similarly, these tools seem relevant for our understanding of gaps beyond mobilization. For example, difference-in-proportions gaps in party preferences would also appear to depend on the underlying assumptions about the distribution of party preferences, and therefore the electoral context. The analysis beyond gender mobilization gaps, however, is left for future research.

Supplementary material

The online supplementary material for this article can be found on the Cambridge University Press platform alongside the article.

Data availability statement

Replication data for this article can be found in Harvard Dataverse at <https://doi.org/10.7910/DVN/5IN>

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Competing interests

None

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