

# Modeling Theories of Women's Underrepresentation in Elections

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**Abstract:** *Research on women candidates in American elections uncovers four key facts: Women (i) are underrepresented among candidates, (ii) are underrepresented among office holders, (iii) perform better in office, and (iv) win open seats at equal rates to men. Scholars offer two types of explanations: Women are less willing to run than men, due to differential costs or a gap in self-perceived qualification, or voters discriminate at the ballot box. We formally model these mechanisms. Lower willingness to run predicts the first three facts but not the fourth. Voter discrimination at the ballot box predicts the first three facts and creates competing effects with respect to the fourth. Thus, the major stylized facts cannot be explained without voter discrimination, whether overt or more subtle. We explore whether a close-election regression discontinuity distinguishes the mechanisms; surprisingly, it does not.*

Why do so few women hold elected office in American politics? Despite making up roughly half of the population, women only constitute about one-quarter of the U.S. House and Senate, and similar proportions in other elected positions. Women are also underrepresented in elected positions in most other countries (Lawless 2015).

In this article, we study a formal model of candidate entry and elections that allows us to represent a variety of prevailing theories of women's underrepresentation, including differential costs of running, difference in perceived electability or suitability for office, and voter discrimination at the ballot box. We show that it is not possible to explain the major stylized facts identified in the empirical literature without some form of voter discrimination at the ballot box, whether it is the result of overt or more subtle forms of sexism.

The literature's initial hypothesis was that voter discrimination at the ballot box explained women's underrepresentation (e.g., Erskine 1971; Ferree 1974). Indeed, although public attitudes have become more positive

toward female candidates in recent decades—the proportion of respondents expressing a willingness to vote for a female candidate for president increased from roughly one-third when the question was first asked in 1937 to about 90% today—substantial portions of the electorate still express doubt about women's suitability for politics. As recently as 2010, for example, 25% of respondents to the General Social Survey agreed that men are emotionally better suited to politics than women, 14% said that women are not “tough enough” for politics, and 16% agreed that “women don't make as good leaders as men” (Lawless 2015). Furthermore, a robust and growing literature finds evidence of subtler forms of sexism, such as Teele, Kalla, and Rosenbluth's (2018) argument that voters have irreconcilable expectations for leaders and for women that put women candidates in a double bind. This literature suggests that gender stereotyping and double standards still exert a strong influence on voters' evaluations of female candidates (e.g., Bauer 2019, 2020a, 2020b; Branton et al. 2018; Cassese and Holman 2018; Dolan 2010; Dittmar 2015; Ditonto 2017; Fulton 2014).

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Despite these attitudes, the political science literature shifted away from theories based on voter discrimination at the ballot box after several studies found that when women do run for office, they win at roughly the same rate as men. Darcy and Schramm (1977) appear to be the first to have made this point, and a spate of subsequent studies by other authors confirmed and extended these findings (Burrell 1994; National Women's Political Caucus 1994; Seltzer, Newman, and Leighton 1997). A central insight of this work is that women's apparent electoral disadvantage disappears once one accounts for incumbency. That is, conditional on running, male and female incumbents win at the same rate, as do females and male challengers; however, most incumbents are male and incumbents win at higher rates than challengers. These "startling" findings "surprised even savvy political operatives, and decidedly contradicted the widely held beliefs that women have a tougher time winning office" (Duerst-Lahti 1998, p. 17).

Many scholars have taken the finding that (controlling for incumbency) female candidates win at the same rate as male candidates as evidence that voter discrimination against female candidates at the ballot box is not an important mechanism underlying women's underrepresentation. For instance, Lawless and Fox (2013, p. 1) offer this assessment of the state of the literature:

Why do so few women hold positions of political power in the United States? For the last few decades, researchers have provided compelling evidence that when women run for office—regardless of the position they seek—they are just as likely as men to win their races. The large gender disparities in U.S. political institutions, therefore, do not result from systematic discrimination against female candidates. Rather, the fundamental reason for women's underrepresentation is that women do not run for office.

A related strand of literature bolsters this argument, contending that although voters may hold stereotypes about the political traits and competencies of women and men, these stereotypes do not influence women's electoral fortunes. According to Dolan (2014, p. 103) "people's abstract gender stereotypes about whether women or men are better at handling policy areas like education or foreign affairs, or which sex is able to provide greater leadership or compassion are *not* related to their vote choice when they choose between women and men candidates in their local house election."

In light of such findings, the literature has proposed a variety of new theoretical mechanisms to ex-

plain women's underrepresentation in the pool of candidates without assuming voters discriminate at the ballot box. One version of such a theory is *differential costs*—differences in costs of running for men and women as a result of gendered household or family roles, political ambition, or tolerance for the electoral process (Lawless and Fox 2005). Another is a *perception gap*—systematic overestimation by men and underestimation by women of their electability (perhaps because of *perceived* voter bias) or of their personal qualification for office (Fox and Lawless 2011). Subsequent work, using both lab and survey experiments, shows evidence consistent with these mechanisms (Kanthak and Woon 2015; Preece and Stoddard 2015; Preece 2016).<sup>1</sup> The existence of these mechanisms may, of course, be the result of a broader discriminatory culture or gender-biased socialization. But they do not depend on voters discriminating against female candidates at the ballot box.

Without dismissing differential costs or the perception gap, Anzia and Berry (2011) argue that the literature had been too quick to write off voter discrimination at the ballot box as an explanation of the empirical facts. They note, first, that if voters discriminate at the ballot box and women correctly anticipate that, then some potential female candidates will be deterred from running. In particular, women will only run if they are of sufficiently high quality to compensate for voter bias. This positive selection will at least partially offset voter discrimination in explaining women's win rate conditional on running.

Moreover, Anzia and Berry point out another empirical prediction of strategic entry deterrence in the face of voter discrimination at the ballot box: Conditional on winning, women will perform better than men. This is both because they will be positively selected into the pool of candidates and because they will have to be of higher quality (on average) to overcome voter bias and win election. Anzia and Berry provide empirical evidence for this latter hypothesis. Using within-district variation, they show that on average female congressional representatives secure more federal funds for their districts than do male congressional representatives, and that congresswomen sponsor or cosponsor more legislation, and attract more cosponsors for their legislation, than do congressmen. (They note that this finding could also result from positive selection due to differential costs.) Subsequent research offers further evidence that female politicians tend to perform better than their male

<sup>1</sup>Another explanation for women's underrepresentation as candidates focuses on bias by parties in the recruitment process (Sanbonmatsu 2006, 2010).

counterparts (e.g., Fulton 2012; Lazarus and Steigerwalt 2018; Volden, Wiseman, and Wittmer 2013).

All told, then, the literature establishes four key empirical findings and offers explanations based on two possible types of mechanism. The findings are as follows:

1. Women are underrepresented among candidates.
2. Women are underrepresented among office holders.
3. Conditional on winning, women perform better than men.
4. Conditional on running (and controlling for incumbency), women and men win at equal rates.

The potential explanatory mechanisms are voter discrimination at the ballot box and differences in willingness to run due to some combination of differential costs and the perception gap.

We study a formal model of the endogenous determination of voting and male and female potential candidates' strategic decisions to enter electoral politics. To capture the mechanisms in question, we consider variants of that model that include differential costs, the perception gap, and voter discrimination at the ballot box. Doing so generates results on which of the empirical findings each of these mechanisms can explain.

Our model is a more complete representation of existing theoretical ideas in the literature than previous formal models in important ways. Unlike the models in Gagliarducci and Paserman (2020) and Gonzalez-Eiras and Sanz (2020), we treat the decision to enter electoral politics by men and women as an endogenous choice. And unlike the model in Fulton et al. (2006), which takes the probability a candidate wins conditional on entering to be an exogenous parameter, we treat electoral fortunes as an endogenous consequence of equilibrium decisions by voters and by other politicians who are also deciding whether or not to run. This has important consequences. For instance, when the probability of winning is endogenous, we see that an increase in voter discrimination at the ballot box affects who is elected through two channels—there is a direct effect on the probability of winning for men and for women and there is an indirect effect that is the consequence of an endogenous change in the set of politicians who decide to run for office. Both channels are substantively important, but they cannot be captured in a model that does not endogenize both entry and the probability of winning.

What does our model say about the fit between the implications of each of these theoretical mechanisms and the empirical facts?

The version of our model that incorporates differential costs and/or a perception gap, but no voter discrimination at the ballot box, predicts the following:

1. Women are underrepresented among candidates.
2. Women are underrepresented among office holders.
3. Conditional on winning, women perform better than men.
4. Conditional on running, women win at a *higher* rate than men.

All of these are the result of a selection effect—because of differential costs and/or a perception gap, women have to be higher quality candidates than men to decide to run. So differential costs or the perception gap, on their own, are consistent with the first three facts, but are inconsistent with the fourth.

The version of our model that incorporates voter discrimination at the ballot box, but not differential costs or the perception gap, predicts the following:

1. Women are underrepresented among candidates.
2. Women are underrepresented among office holders.
3. Conditional on winning, women perform better than men.
4. There are competing effects on the probability of winning conditional on running, and either men or women can win at higher rates depending on which effect dominates.

What are these competing effects? On the one hand, there is a *direct effect* of discrimination—because voters discriminate, a woman of the same quality as a man is less likely to win. On the other hand, there is a *selection effect* from discrimination—candidate anticipation of voter discrimination creates a selection effect in the pool of candidates, so that women candidates are of higher average quality. If these two effects just off-set one another, then the model with voter discrimination at the ballot box is consistent with all four facts. If the selection effect dominates, the model predicts women win more often than men, conditional on running. And if the direct effect dominates, the model predicts men win more often than women, conditional on running. We show that

either effect can dominate in theory, so estimating the magnitude of these effects is an important challenge for future empirical work.

Surprisingly, then, we show that the empirical finding that some argue distinguishes between differential costs/perception gap and voter discrimination at the ballot box in favor of the former does precisely the opposite. It is possible to explain men and women winning with equal probability in a model embodying voter discrimination at the ballot box alone but not in a model embodying differential costs or the perception gap alone. In other words, a model without voter discrimination at the ballot box cannot explain the major stylized facts of women's underrepresentation in electoral politics.

Our analysis advances the literature on women's representation in three important ways.

First, we clarify which empirical implications are, and are not, entailed by the theoretical mechanisms that have been proposed in the literature. Notably, the results just discussed show that the perception gap mechanism cannot explain the “when women run, they win” stylized fact—a surprising finding, given that the mechanism was originally proposed to explain this fact. Indeed, our model shows that the four major empirical facts cannot be explained within a model that does not include voter discrimination, whereas they can be explained with a model that only includes voter discrimination. This too is surprising, given the view among many scholars that overt voter discrimination is a thing of the past. In this sense, our model also lends support to the growing literature suggesting that subtler forms of sexism are likely at work in voter behavior.

Second, we provide a workhorse formal model that can be extended by other scholars to study different aspects of women's representation in electoral politics or other aspects of voter discrimination, perhaps in other contexts or regarding other groups.

Third, we provide guidance for how future empirical analysis can, in dialog with theory, generate new evidence as to which of the two possible explanations is at work. We do so in several ways, but of particular note is our analysis showing that one seemingly promising empirical approach, the election regression discontinuity design, is unlikely to generate such evidence. At first blush, it might seem that close elections should distinguish the mechanisms. One might think that if the reason for female underrepresentation is differential costs or the perception gap and not voter discrimination at the ballot box, then the expected quality (and, hence, future performance) of men and women who win very close elections is the same. If this is the case, we might expect to see no difference in performance once in office in a regression

discontinuity analysis. By contrast, if voters discriminate at the ballot box, we might expect female winners of close elections to be higher quality than male winners of close elections (because the women had to overcome the voters' bias to achieve a near-tie). If this is the case, we might expect to see women perform better once in office than men in an election regression discontinuity analysis. Surprisingly, our model reveals that this intuition is knife edged. In general, both types of mechanism predict that women and men will perform differently once in office, even in a regression discontinuity analysis.

## The Model

There is a continuum of potential female candidates and a continuum of potential male candidates, each of mass  $\frac{1}{2}$ .

Each potential candidate of gender  $\gamma$  has cost of running,  $c^\gamma \in (0, 1)$ . The costs represent any characteristic of real-world politicians that pulls against running—other career opportunities, dislike of campaigning, time away from family, and so on.

Each potential candidate  $i$  has a quality  $\theta_i \in \mathbb{R}$ . Higher numbers represent greater quality. Quality is intended to represent characteristics of candidates that affect performance once in office and that voters care about.<sup>2</sup>

Candidate qualities are distributed according to a distribution  $F$ , with density  $f$ . The density is strictly positive on its support  $[\underline{\theta}, \infty)$ , where we allow for the possibility that  $\underline{\theta} = -\infty$ . We assume that the distribution of quality is the same for male and female potential candidates.

The costs and qualities are publicly observed. To allow for the possibility that potential candidates misperceive their own quality, we introduce strictly increasing functions  $\phi^\gamma(\cdot)$ . A potential candidate of quality  $\theta$  and gender  $\gamma$  perceives their own quality as  $\phi^\gamma(\theta)$ .<sup>3</sup> In the

<sup>2</sup>The key substantive assumption we make throughout is that quality underpins a positive correlation between voter preferences over candidates and performance in office. This is consistent with the empirical literature in American politics finding that elections positively select for politicians who subsequently perform better in office (Alt, Bueno de Mesquita, and Rose 2011; Fourniaies and Hall 2022).

<sup>3</sup>This also allows our model to speak to the literature showing that the decision to run may negatively screen for characteristics that might be positively associated with performance in office (e.g., compassion and honesty) and, indeed, might do so in a gendered way (Clifford, Simas, and Kirkland 2021; Woon and Kanthak 2019). The assumed correlation between electability and perfor-

event that potential candidates correctly perceive their quality, we would have  $\phi^M(\theta) = \phi^W(\theta) = \theta$ . Potential candidates always correctly perceive the quality of other potential candidates—misperceptions are personalized.

A potential candidate who does not run gets a payoff of zero. A candidate gets a benefit of 1 for winning office. So a candidate with cost of running  $c$  makes a payoff of  $1 - c$  for running and winning and a payoff of  $-c$  for running and losing. Thus, a candidate who has cost  $c$  and perceives their probability of winning as  $p$  has an expected utility from running of  $p - c$ . This means that a candidate will run if and only if their perceived probability of winning is at least as high as the cost of running,  $p \geq c$ .

At the start of the game, each potential candidate chooses whether or not to run for office. Candidates are then randomly paired to face each other in elections.<sup>4</sup>

Each election has one representative voter who chooses which candidate wins. A voter evaluates a candidate based on the sum of that candidate's quality ( $\theta_i$ ) and idiosyncratic noise ( $v_i$ ). The voter's evaluation may also depend on candidate gender. The noise,  $v$ , represents unanticipated events that occur over the course of a campaign—for example, gaffes, scandals, or partisan swings. We assume that for any two candidates  $i$  and  $j$ ,  $v_i - v_j$  is the realization of a random variable  $\epsilon$  with density  $g$ . All random variables are independent.

We consider two cases. First, we consider variants of our model where voters do not discriminate against women candidates at the ballot box, but where there are *differential costs* (higher costs of running for women than for men) and/or a *perception gap* (because of internalized sexism, women systematically underestimate their quality and men systematically overestimate their quality). We model these mechanisms as follows:

- *Differential costs*: Women face higher costs of running than do men, so that  $c^W > c^M$ .
- *Perception gap*: The voter correctly perceives the quality of every candidate, but  $\phi^M(\theta) > \theta > \phi^W(\theta)$ .

We show that all such variants (whether with differential costs, a perception gap, or both) yield the same results.

mance in office means that the misperceptions of quality that we allow admit of the possibility that some candidates think they are better than they are, but also that other candidates do not realize how good they could be once in office.

<sup>4</sup>Note that this implies the measure of elections is endogenous to the entry decisions. We make this assumption for expositional convenience; all of the results remain true as statements about expectations conditional on running in a model with a fixed, finite number of elections and random assignment of available candidates to races.

Second, we consider a model with *voter discrimination at the ballot box*, which takes the form of voters receiving an additional positive payoff from electing a male candidate rather than a female candidate, but abstracts away from differential costs and the perception gap. We represent this idea by modeling the voter's payoff from electing a male candidate with type  $\theta$  and shock  $v$  as  $\theta + v + b$ , with  $b > 0$ . By contrast, a voter's payoff from electing a female candidate with type  $\theta$  and shock  $v$  is simply  $\theta + v$ . The parameter  $b$  represents the amount of voter discrimination against female candidates at the ballot box. Notice, this representation is consistent with overt voter discrimination, but might also represent subtler forms of discrimination such as gender stereotyping and double standards that nonetheless affect voter behavior at the ballot box.

We study subgame-perfect Nash equilibria (henceforth, *equilibria*).

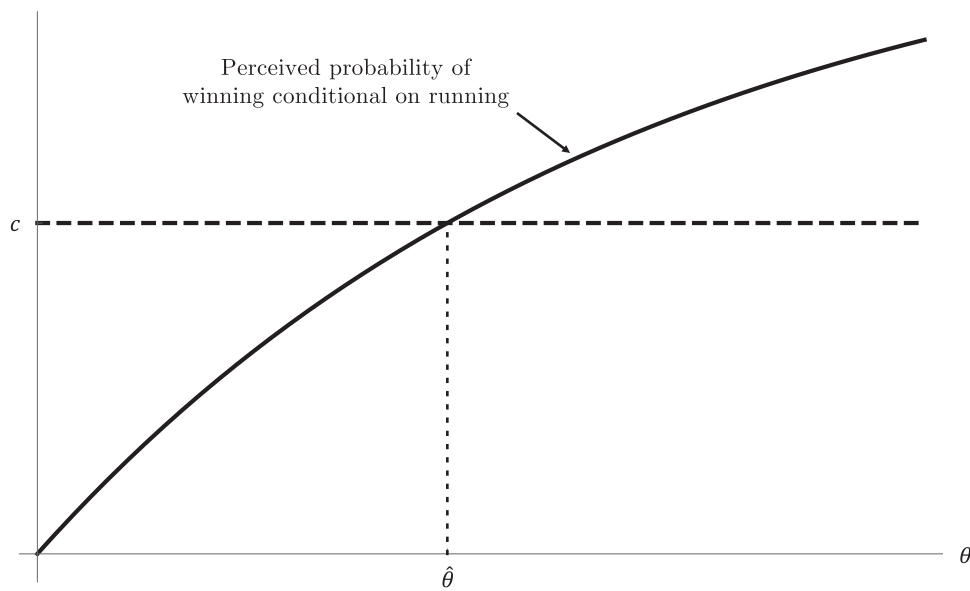
We consider the two versions of the model in turn. But first we analyze our model when men and women potential candidates are completely symmetric—candidates correctly perceive their quality ( $\phi^W(\theta) = \phi^M(\theta) = \theta$ ), men and women have the same costs of running ( $c^M = c^W = c$ ), and voters do not discriminate at the ballot box ( $b = 0$ ). Doing so illustrates the structure of equilibrium and provides a benchmark for comparison.

## A Benchmark

A potential candidate will run if their belief about the probability that they will win is greater than the cost of running. Because candidates are more likely to win the higher their quality, this fact implies that potential candidates' entry decisions in an equilibrium can be described by a *cutoff*—a potential candidate will enter if and only if their perceived quality is above some threshold.<sup>5</sup>

If men and women potential candidates are completely symmetric, then a man and a woman with the same actual quality will have the same perceived quality and the same cost of running. Thus, either both will run or neither will run—in other words, men and women potential candidates' entry decisions will be described by the same cutoff rule. Denote the cutoff by  $\hat{\theta}$ , so a potential candidate runs if and only if their perceived quality is greater than some  $\hat{\theta}$ .

<sup>5</sup>This is consistent with an emerging empirical literature showing that female candidates are more likely to run in politically friendlier districts (Ondercin 2022; Pearson and McGhee 2013).

**FIGURE 1** Equilibrium Cutoff Rule

Notes: A potential candidate runs if and only if their quality is high enough that their perceived probability of winning is higher than the cost of running.

Notice, if a candidate's perceived quality is exactly equal to the cutoff  $\hat{\theta}$ , then they must be exactly indifferent between running and not (i.e., their perceived conditional probability of winning is exactly equal to the cost of running). Because the perceived probability of winning is increasing in perceived quality and perceived quality is strictly increasing in true quality, this insures that potential candidates with quality above the cutoff strictly prefer to run and potential candidates with quality below the cutoff strictly prefer to stay out. Any other cutoff would not have this property, so there would be quality types who would want to change their behavior. This means that, right at the cutoff, a potential candidate's perceived probability of winning must equal their cost of running. This is illustrated in Figure 1.

This analysis implies that, in the completely symmetric benchmark, the following facts hold:

1. There are the same number of female and male candidates.
2. There are the same number of female and male election winners.
3. Conditional on winning, women and men have the same average quality.
4. Conditional on running, women and men win with equal probability.

As we introduce the various mechanisms proposed by the literature, we will see how these implications change, which will help to clarify the explanatory work done by each mechanism.

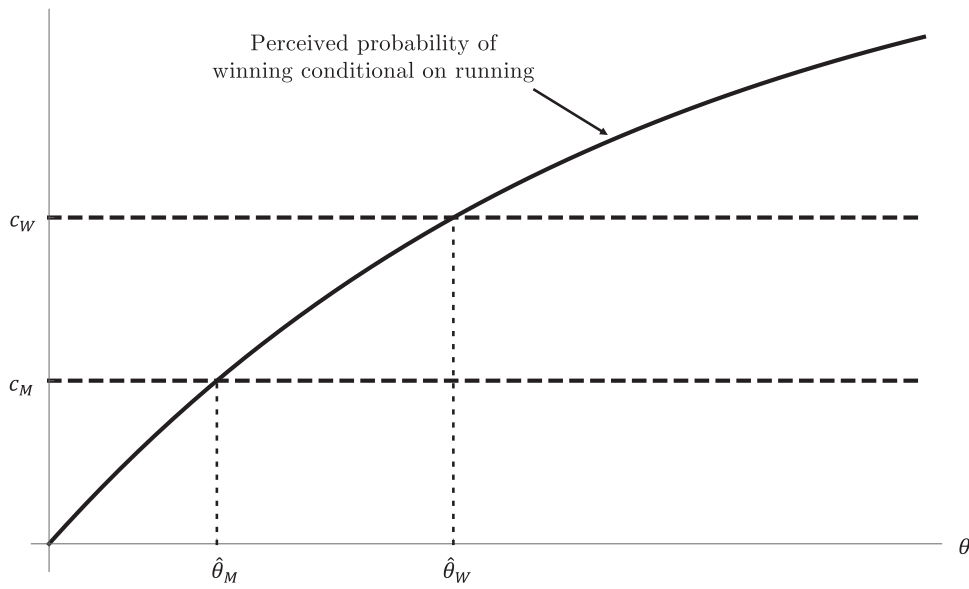
## Election Aversion and/or Perception Gap

Suppose the voter does not discriminate at the ballot box, but there are differential costs, a perception gap, or both.

Before proceeding, let us emphasize that we are not offering, here, a theory of why there might be differential costs or a perception gap. One possible source is a broader culture of discrimination against women or gender-biased socialization with respect to the role of women in politics. Thus, this model should be thought of as one in which voters do not directly discriminate against women at the ballot box, but where social conditions (including, potentially, discrimination), nonetheless create some combination of differential costs and a perception gap.

As in the benchmark case, a potential candidate will run if their belief about the probability that they will win is greater than the cost of running. A candidate's assessment of the probability they will win is still increasing in their perceived quality. So equilibrium will

**FIGURE 2 Cutoff Rules with Differential Costs**



Notes: Women use a higher cutoff rule than men if they have higher costs of running than men.

again be characterized by cutoffs. But now those cutoffs may depend on gender—that is, a potential candidate of gender  $\gamma$  runs if and only if their perceived quality is greater than some  $\hat{\theta}_\gamma$ .

Every potential candidate is comparing their perceived probability of winning to their cost of running. Of course, the perceived probability of winning depends on the entire profile of entry decisions, because this affects the expected electoral strength of a candidate's challenger. In equilibrium, the two cutoffs  $\hat{\theta}_W$  and  $\hat{\theta}_M$  must satisfy two simultaneous indifference conditions. A woman (resp. man) with perceived quality  $\hat{\theta}_W$  (resp.  $\hat{\theta}_M$ ) is exactly indifferent between running or not, given that everyone else's strategy is consistent with those cutoffs.

Now, suppose there are differential costs, but no perception gap. As illustrated in Figure 2, the arguments above imply that, because women have higher costs of running than men, women use a more stringent cutoff. That is, women require a higher probability of winning to be willing to run. (We formalize this claim in Lemma 7 on p. 5 of the Supporting Information [SI].)

Suppose instead that there is a perception gap, but no differential costs. As illustrated in Figure 3, because women underestimate their quality and men overestimate theirs, women again use a more stringent cutoff rule than men. (We formalize this claim in Lemma 7 on p. 5 of the SI.)

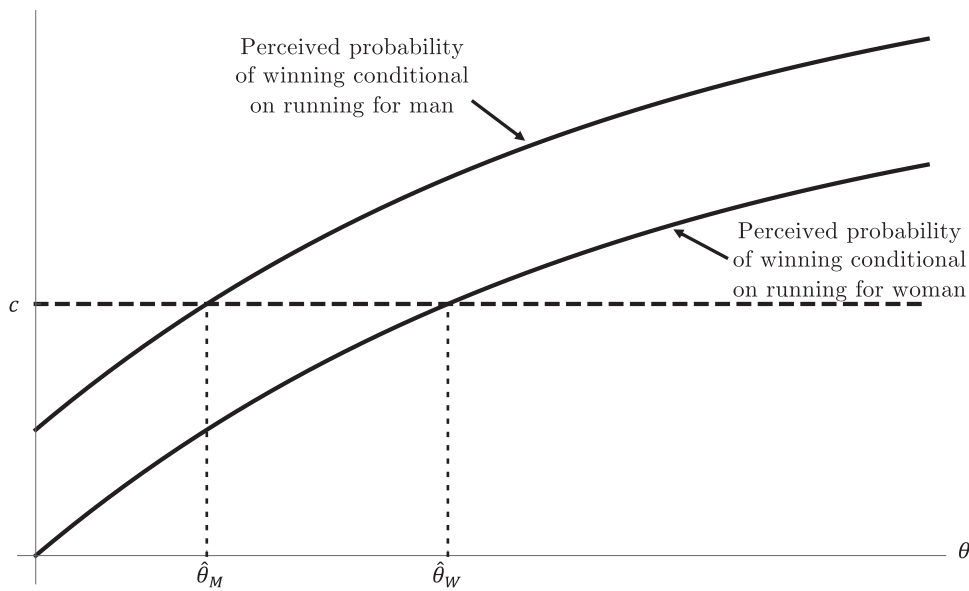
And, of course, if we combine both differential costs and the perception gap, the two effects reinforce one an-

other, so that women use an even more stringent cutoff rule than men.

With this analysis in place, we can compare outcomes in the model with voters who do not discriminate at the ballot box and either (or both of) differential costs and the perception gap to the four corresponding findings from the empirical literature.

The first empirical fact is that women are under-represented among candidates. In the model, because women use a more stringent cutoff rule than men, the pool of candidates has more men than women. So the model with neutral voters and either (or both of) differential costs and the perception gap is consistent with the first finding from the empirical literature.

The second empirical fact is that women are under-represented among office holders. In the model, once they stand for election, female and male candidates are evaluated against the same criteria because voters do not discriminate at the ballot box. There are the same number and distribution of male and female candidates with quality above  $\hat{\theta}_W$ , and so they win at equal rates. But there are also a group of male candidates with quality below that of any female candidate (i.e., those with quality between  $\hat{\theta}_M$  and  $\hat{\theta}_W$ ). These candidates also win with positive probability. Hence, more men than women win office. So the model with neutral voters and either or both of differential costs and the perception gap is consistent with the second finding from the empirical literature.

**FIGURE 3 Cutoff Rules with Perception Gap**

Notes: Women use a higher cutoff rule than men if women underestimate and men overestimate their true quality.

The third empirical fact is that women perform better in office than men, conditional on winning. Because women use a more stringent cutoff rule, the distribution of quality among women candidates is better than the distribution of quality among men candidates.<sup>6</sup> As a result, the average female winner has higher quality than the average male winner.

To see this graphically, Figure 4 shows the distributions of qualities among male and female candidates. The way to see the result is as follows. The only candidates with quality below  $\hat{\theta}_W$  are male. These candidates win with positive probability and they are worse than every female winner. Above  $\hat{\theta}_W$  both male and female potential candidates run and they win with equal probabilities. For men, these winners get mixed in with the male winners with quality below  $\hat{\theta}_W$ . For women, they do not. This is why the average female winner is of higher quality than the average male winner. So the model with neutral voters and either or both of differential costs and the perception gap is consistent with the third finding from the empirical literature.

The fourth empirical fact is that men and women win at the same rate, conditional on running. The probability a candidate wins is increasing in his or her qual-

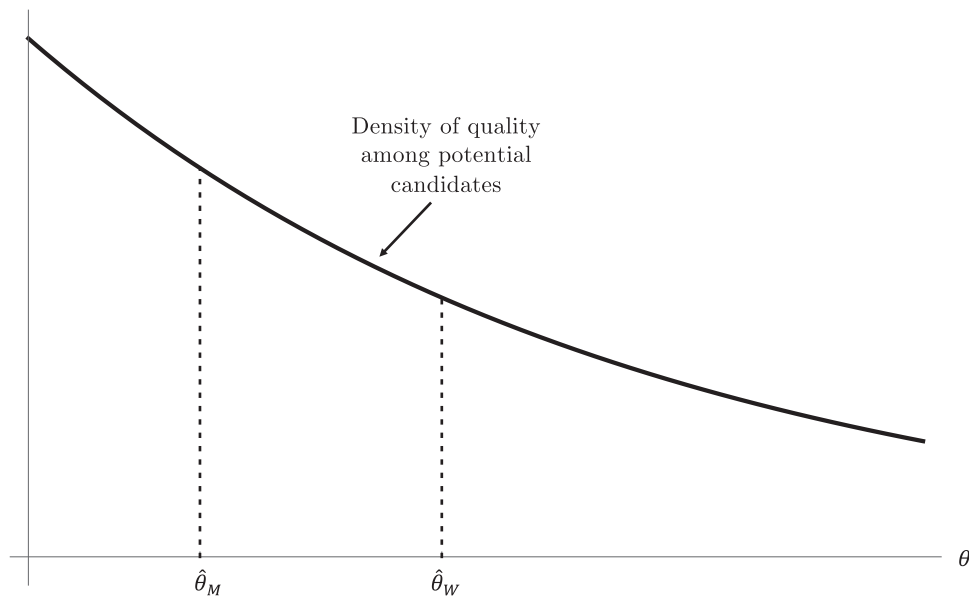
ity and, for a fixed quality, is the same for men and women when voters do not discriminate at the ballot box. And, as we have just discussed, the distribution of quality among female candidates is better than the distribution of quality among male candidates. This implies that female candidates are strictly more likely to win conditional on running than are male candidates. So the model with differential costs and/or a perception gap, but voters that do not discriminate at the ballot box, is inconsistent with the fourth finding from the empirical literature. This incongruity is noteworthy, given that the differential costs/perception gap mechanisms were originally posited in part to explain this empirical finding; in fact, however, these mechanisms, on their own, are inconsistent with equal win rates for men and women.

Taken together the model with either or both of differential costs and the perception gap, but no voter discrimination at the ballot box, implies the following: Women run less often than men, women hold fewer offices than men, women are higher quality than men conditional on winning, and women have higher election rates than men conditional on running. The first three implications match existing empirical results. However, the fourth is inconsistent with the empirical fact that female and male candidates win with the same probability on average conditional on running. These results are summarized in the following proposition. (A more formal development and proofs of all numbered results are in the SI.)

<sup>6</sup>Formally, the distribution of quality of women candidates first-order stochastically dominates the distribution of quality of men candidates.



**FIGURE 4** Density of Quality among Men and Women Candidates



Notes: The distributions of qualities among men and women candidates in the pool of candidates are truncations of the prior distribution, with the truncation occurring at different points based on the cutoff rules that men and women use in equilibrium.

**Proposition 1.** *If there are differential costs and/or a perception gap and voters do not discriminate at the ballot box, then any equilibrium of the model has the following properties:*

1. *There are fewer female candidates than male candidates.*
2. *There are fewer female election winners than male election winners.*
3. *Conditional on winning, women have higher average quality than men.*
4. *Conditional on running, women win with higher probability than men.*

### Voter Discrimination at the Ballot Box

Now assume there are no differential costs or perception gap—so all candidates face a common cost of running,  $c$ , and correctly perceive their quality. But now assume voters discriminate against female candidates at the ballot box,  $b > 0$ . Recall that this might represent overt voter discrimination or more subtle forms of sexism, such as stereotyping or double standards, that affect voter behavior.

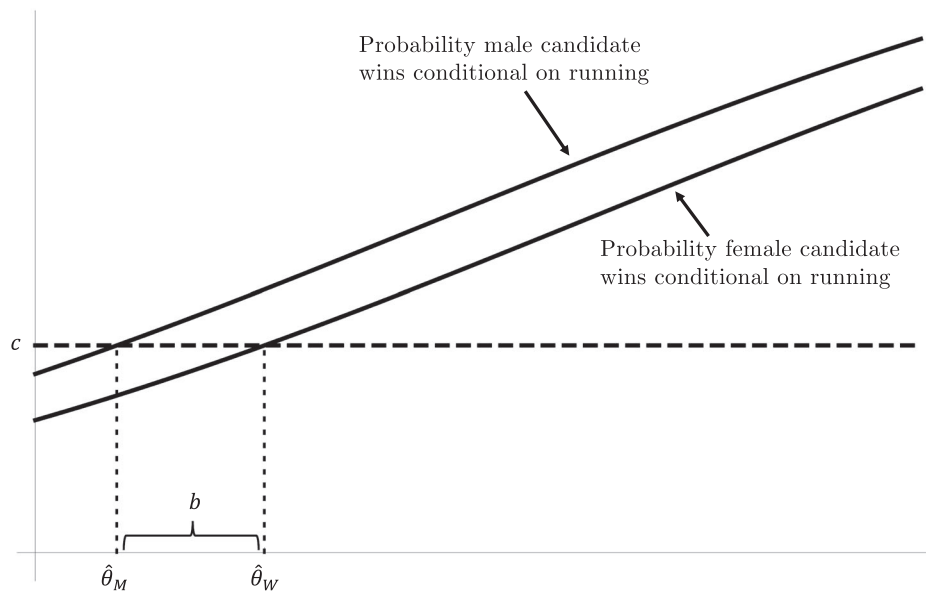
Again, denote by  $\hat{\theta}_W$  and  $\hat{\theta}_M$  the cutoffs used by women and men to decide whether to run. As in the model with differential costs and/or a perception gap, women will use a more stringent cutoff rule here, but for a different reason. When voters discriminate at the ballot box, a female candidate wins with lower probability than a male candidate of the same quality. Hence, the female potential candidate who is indifferent between running and not will need to have a higher quality than the male potential candidate who is indifferent between running and not. Indeed, the difference between the female and male cutoffs will correspond exactly to the amount of voter bias,  $b$ .

This is illustrated in Figure 5 and documented in Lemma 1.

**Lemma 1.** *In any equilibrium of the model with voter discrimination at the ballot box, the male and female entry cutoffs satisfy  $\hat{\theta}_M = \hat{\theta}_W - b$ .*

As in the models with differential costs or the perception gap, the fact that female potential candidates use a more stringent cutoff rule when voters discriminate at the ballot box immediately implies that there are more male candidates than female candidates. Hence, the model with voter discrimination at the ballot box is consistent with the first finding from the empirical literature—women are underrepresented in the pool of candidates.

**FIGURE 5 Cutoff Rules with Voter Discrimination at the Ballot Box**



Notes: Women use a higher cutoff rule than men if voters discriminate against women at the ballot box. The difference between the two cutoff rules is exactly the amount of discrimination  $b$ .

What about underrepresentation of women among office holders? Because of voter discrimination at the ballot box, for a fixed quality,  $\theta$ , a male candidate is strictly more likely to win election than a female candidate. Because the distribution of male and female candidates with quality above  $\hat{\theta}_W$  is the same, this implies that there are more male winners than female winners in this group. And, in addition, there is a group of male candidates with quality lower than any female candidate (those with quality between  $\hat{\theta}_M$  and  $\hat{\theta}_W$ ). Some of these lower quality male candidates also win, further contributing to the overrepresentation of men among office holders. So the model with voter discrimination at the ballot box is consistent with the second finding from the empirical literature.

Now consider the difference in expected quality of women and men, conditional on winning an election. To see that women are of higher quality conditional on winning, note that two things affect the expected quality of winning candidates. The first is the underlying quality distribution they are drawn from. Women in the pool of candidates are of higher average quality than are men in the pool of candidates. This is because women use a more stringent cutoff when deciding whether to run. The other factor that helps determine the expected quality of winning candidates is how high a hurdle they had to clear (on average) to get elected. When competition is stiffer, more

of the relatively low-quality candidates are weeded out. Thus, stiffer competition leads to higher expected quality of winning candidates. Because of voter discrimination at the ballot box, women face a higher hurdle on average. Thus, both forces push in the direction of female winners having higher expected quality than male winners.

Finally, turn to the probability of winning conditional on running. Here, there are competing effects. On the one hand, the distribution of quality among female candidates is better than the distribution of quality among male candidates. This tends to make women more likely to be elected conditional on running. On the other hand, voters discriminate against female candidates at the ballot box, which tends to make women less likely to be elected conditional on running. We formalize this argument in Equation (14) on p. 14 of the SI by decomposing the difference in probability of winning conditional on running into a *direct* effect (which is always negative) and a *selection* effect (which is always positive). It turns out that either of these two effects can dominate, depending on parameters. Thus, whether discrimination at the ballot box can, on its own, explain men and women winning at equal rates turns out not to be answerable by theory alone—it depends on the empirical question of the relative size of these two competing effects.

Taken together, then, the model with voter discrimination at the ballot box gives the following implications.

**Proposition 2.** *Consider the variant of the model where voters discriminate at the ballot box. In any equilibrium,*

1. *there are fewer female candidates than male candidates;*
2. *there are fewer female election winners than male election winners;*
3. *conditional on winning, women have higher expected quality than men;*
4. *the difference in probability of winning conditional on running for women versus men can be decomposed into a negative direct effect and a positive selection effect. Moreover, there exist parameters such that either effect dominates.*

Proposition 2 shows that the model with voter discrimination at the ballot box and no differential costs or perception gap can account for all four empirical facts, if the direct effect and selection effect balance out in just the right way. However, if they do not, then voter discrimination alone also does not account for all four empirical facts.

## Guidance for Empirical Research

Our analysis above suggests two possible theoretical interpretations of evidence related to women's underrepresentation in U.S. politics. The patterns can be explained entirely by voter discrimination at the ballot box, or by a combination of voter discrimination along with differential costs and/or a perception gap. In this section, we offer suggestions for future empirical work that aims, in dialog with theory, to adjudicate between these interpretations.

One strategy is to find settings in which the voter discrimination mechanism is shut down and ask whether the stylized facts still hold. If so, this would constitute evidence that the differential costs and/or perception gap mechanisms are at work, suggesting that voter discrimination alone is not the sole explanation. For instance, a variety of quota systems are used around the world to promote female representation (see, among many other examples, Baltrunaite et al. 2014; Chattopadhyay and Duflo 2004; Jones 2009; Krook 2014). A leading example is Indian village council elections, in which certain seats, selected at random, are reserved for women (Chattopadhyay and Duflo 2004). In this setting, voter discrimination at the ballot box cannot play a role, because all of the candidates are women. So finding that women outperform men on the council would constitute evidence

that the differential costs or perception gap mechanism is at work, whereas finding that they do not would support the interpretation that voter discrimination alone can explain the facts. Of course, there are limitations to this approach. First, it requires studying a country other than the United States, meaning that the resulting evidence is not directly comparable with the results from studies of the U.S. Congress. Furthermore, it would not be possible to study the difference between men and women with respect to the other key outcomes—number of candidates, number of winners, or probability of winning—in a setting where all the candidates are female.

Closer to home, it may be possible to identify U.S. elections for which there is reason to believe that voter discrimination is either absent or significantly reduced. For instance, if Democratic voters are less likely to discriminate against female candidates—an assumption that would need to be validated empirically—then one might study Democratic primary elections or general elections in heavily Democratic congressional districts. Finding support for stylized facts 1, 2, and 4 in those settings would again constitute evidence that differential costs and/or the perception gap are at work. It would not be possible to investigate stylized fact 3, that women outperform men in office, within the context of Democratic primary elections, because the winner of the primary must still win in the general election in order to hold office, and the general election would presumably be subject to higher levels of voter discrimination at the ballot box.

An alternative approach could build on the tradition of laboratory experiments on gender and elections (e.g., Bateson 2020; Kanthak and Woon 2015; Woon and Kanthak 2019; Pruyssers and Blais 2017). Kanthak and Woon's (2015) experiment allowed male and female participants to put themselves forward as candidates for positions that would be either elected or chosen at random. Women were less likely to put themselves forward when the position would be filled by an election, which the authors interpret as evidence of one particular type of differential costs, which they call *election aversion*. An extended version of such an experiment could look for ways to vary the presence of voter discrimination in the simulated elections, for instance, by allowing individual participants to see or not see the gender of other participants. As with all laboratory experiments, of course, the persuasiveness of this exercise would hinge on convincing readers that the setting generated in the lab is sufficiently similar to real-world elections that the results of the experiment are informative about the mechanisms at work in actual elections.

## Do Close Elections Distinguish the Mechanisms?

The suggestions above all focus on distinguishing between the two mechanism by estimating the existing empirical quantities of interest in settings where one of the mechanisms is shut down. But scholars might also want to look for new empirical quantities to try to distinguish these mechanisms.

Using a regression discontinuity design, Anzia and Berry (2011) show that women perform better than men in congress, even conditional on a close election. They are cautious in their interpretation of this result because their regression discontinuity (RD) sample is small and they find covariate imbalance. Most notably, incumbents are more likely to win even in close elections, consistent with Caughey and Sekhon (2011).<sup>7</sup> Nonetheless, this approach raises interesting questions about what could, in principle, be learned about the mechanisms from such an analysis, in a setting where the RD assumptions were more clearly satisfied. In this section, we use our model to explore this question.

At first blush, it might seem that close elections should distinguish differential costs/perception gap and voter discrimination at the ballot box. To see the idea, consider a setting in which there is no electoral noise (i.e., the variance of  $v$  goes to zero). Then, with differential costs and/or a perception gap, but no voter discrimination at the ballot box, a man and a woman tie only when  $\theta_W = \theta_M$ . This implies that women and men have the same expected quality conditional on a close election. By contrast, with voter discrimination at the ballot box, but no differential costs or perception gap, a man and a woman tie only when  $\theta_W = \theta_M + b$ . In that case, women have higher expected quality than men conditional on a close election. So, the argument goes, if an electoral regression discontinuity analysis found no difference in performance between men and women, this would be evidence in favor of differential costs or the perception gap, whereas if an electoral regression discontinuity analysis found that women performed better than men in office, that would be evidence in favor of voter discrimination at the ballot box.

Although this argument is intuitive, our model shows that it is knife edged. With any electoral noise (i.e., the variance of  $v$  is positive), this intuition breaks down for both mechanisms.

This result is particularly surprising in the case of differential costs/perception gap. As we just saw, without

noise, we would expect no difference between men and women conditional on a close election. How does the argument fail once there is electoral noise? With noise, the condition for a tie is  $\theta_W + v_W = \theta_M + v_M$ . As we saw in Figure 4, with differential costs and/or a perception gap, the distribution of quality for female candidates is better than the distribution of quality for male candidates. As such, it is more likely that a woman and a man tie because the woman had higher quality but the noise favored the man than because the woman was lower quality but the noise favored the woman. This implies that, with differential costs or a perception gap, even conditional on a close election, female candidates are higher expected quality than male candidates. Thus, these mechanisms predict that women will perform better in office than men, even in a regression discontinuity analysis.

In the case of voter discrimination at the ballot box, with electoral noise, there are competing forces, even in close elections. As in nonclose elections, in close elections female candidates have overcome voter discrimination to achieve a tie, which directly tends to make them higher quality on average. But, because discrimination affects selection into running for office, female candidates have also faced systematically weaker opponents, which tends to make them weaker on average when they tie. We formalize this argument in Equation (15) on p. 15 of the SI by decomposing the difference in expected quality conditional on a tie into a *direct* effect that is always positive and a *selection* effect that can be negative. We show that either effect can dominate, depending on parameters. Thus, whether discrimination at the ballot box predicts that men or women will perform better on average in a regression discontinuity analysis is not answerable by theory alone—it turns on the empirical question of the relative size of these two effects.

These facts are summarized in the following result.

### Proposition 3.

1. *In the model with differential costs and/or the perception gap, conditional on a tied election, women have higher expected quality than men.*
2. *In the model with voter discrimination at the ballot box, conditional on a tied election, the difference in expected quality of women versus men can be decomposed into a positive direct effect and a potentially negative selection effect. Moreover, there exist parameters such that either effect dominates, so that the difference in expected quality can be positive or negative.*

<sup>7</sup>See Appendix B of Anzia and Berry (2011) for a discussion.

So, despite the intuition with which we opened, the unfortunate fact is that a regression discontinuity design cannot cleanly distinguish the mechanisms. They are both consistent with women performing better than men, conditional on winning a close election. (It is worth noting that this is consistent with Anzia and Berry's findings.) That said, only the model with voter discrimination at the ballot box admits of the possibility that men perform better than women, conditional on a close election. So were empiricists to find that result, it would be evidence in favor of the voter discrimination mechanism.

As this example highlights, understanding which empirical quantities do and do not distinguish these mechanisms can be quite subtle. We hope that having a workhorse model in which one can directly model various research designs and study when they do and do not distinguish will prove helpful for this endeavor going forward (Ashworth, Berry, and Bueno de Mesquita 2021).

## Conclusion

We have proposed a model of endogenous electoral entry that we believe can serve as a workhorse for analyzing issues of the underrepresentation of women (and, potentially, other groups) in electoral politics. To demonstrate its usefulness, we used it to explore the extent to which theoretical mechanisms advanced in the literature—differential costs, the perception gap, and voter discrimination at the ballot box—can explain existing empirical findings.

Differential costs and the perception gap, we found, are consistent with three key facts: Women are underrepresented among candidates, women are underrepresented among office holders, and women perform better than men in office. But they alone cannot explain why men and women win at equal rates contingent on running. Rather, they imply that women should win at higher rates than men.

Voter discrimination at the ballot box, we showed, is also consistent with women being underrepresented among candidates and office holders, and female office holders performing better in office. But the implications of voter discrimination at the ballot box for the win rates of men and women depends on how two competing forces—a direct effect and a selection effect—balance out. Voter discrimination at the ballot box alone can explain why men and women win at equal rates contingent on running, but only if these two effects offset one another in just the right way.

We also showed that both mechanisms predict that men and women perform differently in office conditional on a close election. Differential costs and the perception gap predict that women will perform better than men, conditional on a close election. Voter discrimination at the ballot box gives rise to competing effects and, as such, the implications can go either way depending on which effects dominate.

These results leave open two possible avenues for explaining the existing empirical findings in terms of these two mechanisms.

One possibility is that all the existing empirical findings can be explained by voter discrimination at the ballot box alone. We demonstrate this in Example 5 on p. 18 of the SI. In that example, we assume there is voter discrimination at the ballot box but not differential costs or a perception gap. We show computationally that we can choose parameter values such that the model is consistent with all four empirical facts—women are underrepresented among candidates, women are underrepresented among office holders, women are higher expected quality than men conditional on winning, and women and men win at the same rate conditional on running.

The other possible avenue is that the empirical facts are best explained by a combination of the mechanisms. As we have seen, each mechanism is consistent with the same three facts: There are fewer female than male candidates, there are fewer female than male office holders, and women are higher quality conditional on winning. With respect to probability of reelection, the two models may be inconsistent with the empirical finding in opposite directions. Differential costs and the perception gap predict women win more often than men, conditional on running. If the direct effect outweighs the selection effect, voter discrimination at the ballot box predicts women win less often than men, conditional on running. It is intuitive, then, that a model incorporating both could be consistent with all of the empirical facts, even while neither on its own is. The mechanisms reinforce one another with respect to the share of candidates who are male versus female, the share of office holders who are male versus female, and the quality differential of male versus female elected officials. At the same time, the mechanisms pull in opposite directions with respect to the probability of winning conditional on running. If they off-set, then a model that incorporates both will be consistent with all three facts, whereas a model incorporating either one on its own cannot be. Example 6 on pp. 18–19 of the SI shows that it is indeed possible for such a combined model to explain all of the existing empirical findings.

Notably, both interpretations indicate that the stylized facts about women's underrepresentation in electoral politics cannot be explained without voter discrimination at the ballot box—and the facts may be explained by voter discrimination alone. As such, research focused on voter discrimination, especially emerging work on subtler forms of sexism, stereotyping, and double standards (e.g., Bauer 2019, 2020a, 2020b; Branton et al. 2018; Cassese and Holman 2018; Dolan 2010; Dittmar 2015; Ditonto 2017; Fulton 2014; Teele, Kalla, and Rosenbluth 2018), is as important as ever, and may provide important nuance to the “when women run, they win” axiom. Indeed, because our model suggests that we cannot logically explain the four key empirical facts without some form of voter discrimination at the ballot box, to the extent that the evidence also suggests that there is relatively little overt discrimination among voters, our findings point toward the importance of these subtler types of sexism.

Our goal is that this workhorse model explicates the empirical implications of the main theoretical mechanisms that have been proposed in the literature to date, and points the way toward further fruitful interactions between theory and empirics to help advance our understanding of underrepresentation in politics.

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## Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

**Appendix A:** Proofs

**Appendix B:** Computational Examples