How Framing Gender Diversity in Government Affects Perceptions of Substantive Representation[*]

Lauren Wright[†] Jonathan Mummolo Madeleine Marr

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Abstract

How does elite rhetoric emphasizing women's presence in government affect perceptions that government will substantively represent women? Building on past work on women's representation and framing effects, this paper tests how subtle changes in political communications spotlighting a group's presence in government signal that government has prioritized the group's welfare. We first draw on original panel data on federal employee gender between 1973-2020, showing that women remain underrepresented in the bureaucracy despite efforts by presidents to trumpet recent gains. In pre-registered and replicated experiments, we show presenting statistics on federal agencies' gender compositions in terms of women's job shares (e.g., 20% of an agency's jobs are "held by women") rather than logically equivalent information emphasizing men (e.g., 80% "held by men") increases beliefs that government represents women's interests. Elites can impart the impression of substantive representation by arbitrarily altering rhetoric concerning descriptive representation.

Short Title: Framing Gender Diversity in Government

keywords: gender, executive branch, framing, descriptive representation

1 Introduction

Politicians of both major U.S. parties routinely make high-profile displays of gender diversity in the governments they lead. From Reagan's celebration of women's suffrage on the South Lawn of the White House encircled by hundreds of women bureaucrats, to Clinton and Biden's speeches and op-eds promising that their cabinets would 'look like America,' presidents have gone to great lengths to give Americans the impression of diversity (Locin, 1995; Biden, 2020). What are the effects of this brand of political communication? In particular, how does messaging emphasizing the presence of a marginalized group in government affect perceptions of whether government is looking after that group's welfare?

There are many potential normative and practical benefits to highlighting the presence of women in government, which have been especially well documented in the congressional context (Swers, 2002; Carroll and Fox, 2010; Anzia and Berry, 2011). For example, publicizing women serving in prominent roles may inspire more women to run for higher office (Gilardi, 2015), and scholars have pointed to increased legislative responsiveness and enhanced perceptions of government legitimacy as reasons "women should represent women" (Mansbridge, 1999; Schwindt-Bayer and Mishler, 2005). Scholars have also long emphasized that a "representative bureaucracy" staffed by agents who share social identities with members of the public is key to a properly functioning executive branch (Kingsley, 1944).

Yet as we later show, women remain significantly underrepresented at multiple levels of the executive branch, with only 23% of top tier posts occupied by women as of 2020. In this paper, we investigate the disconnect between political communications that emphasize women's presence in government with their drastic underrepresentation in the bureaucracy.

In particular, we ask whether such communications, regardless of intent, have the ability to alter views of government's substantive representation of women even in the absence of representational gains.

Our study builds on a rich literature on framing effects in public opinion showing that increasing the relevance of a concept can change how a related topic is perceived, even if added attention to the stimulus is unintended or unwarranted (Kahneman and Tversky, 1979; Druckman, 2001; Gross and D'Ambrosio, 2004; Sniderman and Theriault, 2004; Boudreau and MacKenzie, 2013; Scheufele and Iyengar, 2012; Boydstun and Glazier, 2013; Klar et al., 2013; Coe et al., 2017; Feezell, Glazier and Boydstun, 2021). That is, communications which present equivalent information, but emphasize different facets of that information, can lead to divergent perceptions that are sometimes socially and politically consequential. In a foundational example, Kahneman and Tversky (1979) show that framing outcomes in terms of losses rather than gains (e.g. a '25% chance of losing a game' vs. a '75% chance of winning a game') leads to sharply different preferences despite the fact that the two statements are logically equivalent. In addition, Winter (2008) assesses whether priming individuals' race and gender schemas by framing political issues differently can change attitudes on issues such as healthcare and welfare, finding that gendered elite rhetoric amidst the 1994 healthcare debates shifted opinion on reform.

In this paper, we extend this framework to study political communications about gender diversity in government, and ask whether changes in emphasis about the presence of women can alter perceptions of government's substantive representation of women. Specifically, we hypothesize that, given the historic absence of women in government, information on the presence of women in government–however few–may be interpreted, (in the parlance of Kahneman and Tversky), as a 'gain,' especially among those who view women's represen-

tation as important. In turn, we believe this will lead to observable changes in perceptions of related concepts like substantive representation.

To investigate this question, we first present a descriptive analysis of a novel time-series data set assembled through public records requests quantifying the presence of women in federal agencies between 1973-2020. The aim of this analysis is to place political communications emphasizing the presence of women in context. Messages that emphasize women's presence in a world where women are proportionally represented may have qualitatively different consequences than similar messages conveyed in a world where women lack adequate representation. However, there is no readily available data source quantifying women's job shares at multiple levels across federal agencies over time.

Using our newly constructed data set, which we describe in detail below, we first show women are increasingly represented among top-tier federal posts in federal agencies,[1] moving from 2% to 23% between 1973 and 2020. However, these gains have not been monotonic: they tend to emerge under Democratic presidents, only to be partially undone under Republican administrations, resulting in an overall upward trajectory but low levels overall. We further show women's share of rank and file federal jobs has been much more stagnant, climbing to 39% by 2020 but still well below the share of women in the U.S. workforce. In sum, women have made gains, but remain severely underrepresented relative to men in the executive branch.

Having established that women remain underrepresented in the bureaucracy across a range of policy areas and at multiple levels, we present a precise test of whether rhetorical emphasis on women in government affects perceptions of government's substantive rep-

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[1]Top-tier posts as defined throughout include Senate-confirmed Executive Schedule and salary-equivalent positions paid at levels I through V in Cabinet agencies.

resentation of women, holding concrete gains for women constant. To achieve this, we randomly assign participants to read brief mission statements of various federal agencies, and then convey the gender composition of each agency's employees by either emphasizing the percent of jobs belonging to women or men, while holding the substantive content of this information fixed (e.g. either stating an agency is comprised of 40% women or 60% men; logically equivalent information).[2] We find consistent evidence this subtle change in emphasis increases perceptions that an agency will better represent women. With one exception, effects on both outcomes—2-5 percentage points, on average—hold regardless of the agency being described. In fact, these effects are so strong that informing people 20% of an agency's jobs are held by women causes them to be nearly as optimistic about an agency's ability to represent American women as informing people that 50% of jobs are held by men. In other words, information implying a *smaller* share of women in government is received nearly as positively as information implying a much larger share so long as the language emphasizes women. In line with prior research on "issue publics" showing information which is highly relevant to individuals is more likely to be salient when encountered (Krosnick, 1990; Iyengar et al., 2008; Stroud, 2011), we also find these effects are stronger among women participants. However, contrary to expectations, find little evidence that effects vary by respondents' partisan identity.

This study makes an important contribution by extending classic findings on cognitive biases to investigate how individuals form opinions on the treatment of marginalized groups by government. In keeping with prior work on framing effects, we find that subtle changes in emphasis regarding the presence of women in the federal bureaucracy can enhance per-

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[2]We discuss the categorization of gender and how it relates to our administrative data in Appendix Section B.3.

ceptions that government is looking after women's interests, relative to logically equivalent information emphasizing the presence of men. This finding not only enhances our understanding of the role of communication in how citizens conceptualize diversity in government, but also raises several questions about the motives behind, and consequences of, this brand of messaging. While such communications may simply seek to encourage members of marginalized groups to enter the halls of power, the fact that discernible changes in perceptions are generated by such subtle and arbitrary changes in phrasing opens the possibility of cheap talk: politicians can convey the impression of progress, perhaps unintentionally, even in the absence of tangible gains.

In what follows, we review relevant portions of the literatures on women's representation in government and framing effects before introducing and analyzing an original panel data set on the gender composition of various tiers of federal agencies since 1973. This descriptive analysis establishes several patterns and stylized facts about the dynamics of gender diversity in the executive branch over the past five decades that provide important context to our study. Next, we elaborate on the experimental design we use to test our core predictions. We then report results, and conclude with a discussion of the implications of our findings for the dynamics of substantive representation, and potential extensions of our framework for scholarship on race- and class-based diversity in government.

2 Literature Review: Conceptions of Gender Representation in Government

While calls for a government that resembles its citizens have often focused on elected offices, similar arguments have been made with respect to the bureaucracy (Mosher, 1968; Niskanen, 1971; Saltzstein, 1979; Meier, 1993; Dolan and Rosenbloom, 2015). For example

Kingsley (1944) argues that the very ability of the democratic state to triumph over its totalitarian rivals depends on its ability to resist excluding "any considerable body of its citizens from full participation in its affairs. It requires at every point that superior insight and wisdom which is the peculiar product of the pooling of diverse streams of experience," (Kingsley, 1944, 185).

This conceptualization of representation is utilitarian: it argues that government will function better when its occupants can harness the diverse experiences of its citizens.[3]. But there are other arguments for, and conceptualizations of, representation. In particular, Pitkin (1967) clarified several definitions which have touched off serious debates among scholars about whether descriptive representation (the extent to which a representative resembles the represented), and symbolic representation (the way a representative purports to, or gives the impression that, they stand for the represented, perhaps even in the absence of substantive efforts), translate to substantive representation: action by a representative on behalf of the represented (Dovi, 2018; Pitkin, 1967, 92). These include, but are not limited to, arguments about whether representatives need to share physical or background characteristics with their constituents to do an adequate job with the act of representing them (Phillips, 1998; Mansbridge, 2003, 2009) and empirical studies of whether descriptive representation yields normative, perceptual, and measurable benefits for the underrepresented and at what stage in the political process this occurs (Kathlene, 1994; Jeydel and Taylor, 2003; Lawless, 2004; Mateo Diaz, 2005; Lawless and Fox, 2022).

Most central for the current study, Pitkin's discussion of symbolic representation is useful for understanding how the presence of women bureaucrats is often promoted to the

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[3]We note that empirical evidence for the impact of women bureaucrats on policy outputs remains mixed (Maier, 1975; Dolan, 2001; Ba et al., 2021; Potter and Volden, 2021)

public by presidents. This is because symbolic representation occurs when, in Pitkin's words, a group is "present by its presence, although it is not really present in fact" (Pitkin, 1967, 92). Indeed, for decades, presidential administrations have relied on a small handful of executive branch appointments to signal their commitment to women's issues and representative government, even though, as we later show, women's representation is lacking at multiple levels of the federal bureaucracy.

Perhaps the most visible example of this exercise is the appointment of women to head Cabinet agencies. Presidents are praised when their Cabinets "look like America," as President Clinton famously touted, and chastised when they do not (Locin, 1995). President Obama became defensive at the start of his second term in light of charges that he had appointed no more women to Executive Branch leadership posts than President Clinton had almost two decades earlier. "Until you've seen what my overall team looks like, it's premature to assume that somehow we're going backwards," said Obama. "We're not going backwards, we're going forward," (Lowrie, 2013). Continually faced with questions about President Trump's alleged sexism and misconduct, Trump administration officials and allies were quick to point to the number of women who worked as top advisors in the Trump White House and as Cabinet secretaries, which has at times surpassed his predecessors (Kessler, 2018; CAWP, 2019; Ward, 2019). Even before Biden's inauguration, the number of women and people of color on his Cabinet shortlist was closely scrutinized, with liberal groups expressing concern that the appointments looked "male-er" (Shear and Crowley, 2021) than they had hoped. Biden himself asserted in a June 2020 op-ed that "Across the board—from our classrooms to our courtrooms to the president's Cabinet—we have to make sure that our leadership and our institutions actually look like America,"(Biden, 2020).

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What do we know about the consequences of these kinds of appeals? The effects of symbolic representation remain debated in the literature, which predominately consists of studies of legislative bodies. Based on case studies of ethnonationalism in Sri Lanka and network politics in Senegal, Stokke and Selboe (2009) argued that symbolic representation ought to be reconceptualized as "acting for" rather than "standing for" an underrepresented constituency (75). Others have found little evidence that symbolic representation yields the same impact on political attitudes (Lawless, 2004) or views of government (Lee and McClean, 2021) that are normally associated with descriptive representation, leaving open the possibility that emphasizing symbolic representatives benefit neither the person being highlighted nor the group they stand for. And, as Childs (2008) discusses in the context of British politics, sexist and gendered media coverage of women politicians could even amount to a negative effect of symbolic representation (141).

To build on this line of empirical study, we next theorize about the perceptual impacts of displaying gender diversity in government by engaging the literature on framing effects. This literature forms the basis of our central prediction: that information concerning descriptive representation for a group can lead individuals to infer changes in substantive representation for that group.

3 How Framing Diversity in Government Affects Perceptions of Substantive Representation

Though its meaning has evolved and been debated over the years (Chong and Druckman, 2007), a framing effect, at its core, is a matter of emphasis—depending on which aspect of a fact or set of facts is highlighted, perceptions of that fact or a related issue can change (Klar and Schmidt, 2017). Psychological research stemming from Kahneman and Tversky's

pivotal work on "choices, values, and frames" has consistently demonstrated differential responses to information presented in terms of losses and gains (Kahneman and Tversky, 1984), forming a basis for public opinion research showing that changing the form and wording of survey questions can alter responses (Iyengar, 1996). Framing effects may be as straightforward as the tendency of respondents to draw on information presented to them most recently by an experimenter when answering a question (Bishop, 1987; Krosnick and Presser, 2010), but cognitive biases toward information that is made salient take a variety of forms. For example, Nisbett and Wilson (1977) presented college students with word pairs that make certain brand names salient and found that linguistically associated concepts were more readily recalled later on.

Gender and race have been shown to be particularly powerful frames that can affect attitudes on a variety of political issues (Winter, 2008; Stephens-Dougan, 2023), for example prompting lower public support for government assistance to "people on welfare" versus government assistance for "the poor"(Smith, 1987, 77). While prior research has largely focused on framing effects in the contexts of policy discussions (Hopkins and Mummolo, 2017) or current events (Diamond, 2020), we theorize that the ways in which presidential administrations discuss and spotlight members of their administrations also create the opportunity for framing effects to occur. Presidents have discretion over which members of their administrations to draw attention to when communicating to the public, and in doing so, they can convey subtle but powerful signals that they prioritize the needs of groups with which those employees identify. In other words, presidents have a substantial ability to make some government employees salient, and in turn increase the perception that government is attentive to the needs of particular constituencies.

The targeted nature of these communications also suggests that they will not be uni-

formly effective across individuals. Rather, based on robust literatures on differential attention (Taylor and Thompson, 1982; Braun, Gaeth and Levin, 1997) and "issue publics" showing individuals find personally relevant information highly salient upon encountering it (Krosnick, 1990; Iyengar et al., 2008)—including women when encountering news on issues like reproductive freedom and health (Bolson and Leeper, 2013; Mummolo, 2016)—we expect group members in the mass public to be most responsive to communications that emphasize administration officials belonging to the same group. Research in social psychology also continues to show evidence of basic implicit biases for in-group members across a variety of contexts, including gender (Rudman and Goodwin, 2004). In the case of women, not only is the presence of women in government relevant, it may also resonate more strongly to an audience of women because women are much more likely to believe gender discrimination to be a serious issue than are men (Vandermaas-Peeler et al., 2018; Poushter and Fetterolf, 2019; Menasce Horowitz and Igielnik, 2020; Horowitz and Goddard, 2023). Women and other groups attuned to historical gender discrimination may also perceive that due to gender-based exclusion, the women that manage to make it to the halls of power despite this headwind are more competent than their male counterparts (Anzia and Berry, 2011). Put differently, in the parlance of Kahneman and Tversky, making the presence of women—however few—salient will be processed as a "gain" among groups who value gender diversity, especially given the historical absence of women in these posts demonstrated in our descriptive analysis below. We therefore predict that communications which emphasize women's presence in government will be particularly effective among women.

In addition, surveys indicate that Democrats purport to care more about an inclusive and gender equal society than their Republican counterparts (Najle and Jones, 2019). These patterns are consistent with the partisan dynamics in gender composition demonstrated

in Section 4.2. We therefore also hypothesize that Democrats will be more affected by the changes in emphasis we describe. While our hypotheses take no position on whether Republicans will remain indifferent, or react negatively to these appeals, recent research suggests that on the closely related issue of racial diversity, conservatives neither discount nor favor candidates of color, while liberals tend to favor them (Agadjanian et al., 2023). [4]If the same pattern holds with respect to gender, indifference among Republicans would also be consistent with our prediction that appeals concerning gender diversity will be especially effective among Democrats, though we do not focus on that distinction in this study.[5]

Before outlining our experimental tests of this claim, we first present a new descriptive analysis showing women remain underrepresented in government jobs at multiple levels of the federal bureaucracy, while highlighting important partisan dynamics over time— patterns which we believe provide context for, and potentially condition, the perceptual responses we demonstrate in our experiment.

4   Women in the Executive Branch Over Time

A comprehensive examination of the effects of political rhetoric on perceptions of women's representation requires historical context on the strides made by women thus far. But over-time data on the gender composition of executive branch agencies is not readily available. To understand the state of women's representation—which we theorize will bear directly on

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[4]See Appendix B.2 for pre-registration of these hypotheses.

[5]One limitation to our approach is that it does not make predictions about, or analyze, the degree to which the media environment alters the effects of the political communications we are studying. We suggest ways to incorporate this feature into future work in the final section.

how political communications about gender diversity are interpreted in the mass public—
we solicited historical records on agency-level gender composition from the federal Office
of Public Management (OPM) and merged them with publicly available records from more
recent years. We also manually constructed a data set on the gender of "top-tier" Senate-
confirmed executive posts over roughly the same period. Using these data, we establish
descriptive patterns below that provide context for our subsequent experimental analy-
sis: (i) major progress for women in the bureaucracy has occurred relatively recently and
proceeded at different rates across levels of agencies; and (ii) women have had higher repre-
sentation under Democratic administrations than Republican ones, on average, a fact that
informs a hypothesis relating to partisanship, as discussed in Section 3.

4.1 Data on Gender Diversity in the Executive Branch

Our panel data set of employee gender in federal agencies comprises two levels: overall
gender composition among rank and file employees in cabinet-level agencies, and the gender
composition of Senate-confirmed positions in the same years (1973-2020).[6] The rank and
file statistics come from a combination of numerous requests for non-public data we made
to OPM, which provided us with data for 1973-2014, and publicly downloadable data at
the OPM FedScope website covering 2015-2020.[7]

Because data on the gender of Senate-confirmed "top-tier" employees over time was not

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[6]The agencies in our data include: Agriculture, Commerce, Department of Defense (in-
cluding separate gender statistics for Air Force, Army, Navy), Education, Energy, Housing
and Urban Development, Homeland Security, Heath and Human Services, Interior, Justice,
Labor, State, Transportation, Treasury, Environmental Protection Agency, and Veterans
Affairs.

[7]To determine the gender composition of rank and file employees we compute the share
of an agency's employees that are women among employees with a specified gender in the

readily available, we and our research assistants manually coded this information using the 1968-2020 "Plum Books," (formally, the United States Government Policy and Supporting Positions), and United States Government Manuals—official handbooks of the Federal Government published each year in a special edition of the Federal Register (Light, 1995).[8] Gender was coded based on employee's first names, coupled with additional information from internet searches in ambiguous cases. While computational techniques have been devised to classify gender (Hu, 2021; Wais, 2016), the prestigious nature of Senate-confirmed presidential appointments allowed us to use pronouns in bios, press releases, news stories, and transcripts from Senate hearings, obtained through standard Google searches, to adjudicate cases where the correct gender of officials was ambiguous. To verify the accuracy of this large manual coding effort, we randomly sampled 100 rows of our dataset and confirmed via web searches that the pronouns and honorifics used in public documents matched the gender codings in our data. This exercise produced an accuracy estimate of 99%. See Appendix A.2 for details.

As Figure 1 shows, not a single woman assumed a Cabinet position until the appointment of Frances Perkins as Sec. of Labor in 1933, 13 years after the ratification of the 19th Amendment granting women the right to vote (UVA, 2021). However, this macro view of women's representation masks important partisan dynamics that emerge from our more detailed panel data.

OPM data.

[8]Note: whether a particular agency job is Senate-confirmed varies in some cases over time. To minimize the degree to which the composition of our sample changes over time, we include positions in this top-tier category if they were Senate-confirmed at any given point during the years we study.

Figure 1: **Women in the President's Cabinet Since 1789.** The plot displays the percent of Cabinet positions held by women since the U.S. Constitution took effect. The black time series shows "Cabinet" positions, which includes the vice president and the heads of 15 agencies, and the blue time series shows "Cabinet-level" positions, which includes the Cabinet and additional positions presidents can elevate to Cabinet status at their discretion, such as the chair of the Council of Economic Advisors (CAWP, 2021). The percent women in the total U.S. workforce (BLS, 2021), among U.S. CEOs, and among Fortune 500 CEOs are plotted for reference (Quantic, 2021). Both Cabinet time series remain constant at 0% until the appointment of Frances Perkins as Secretary of Labor in 1933.
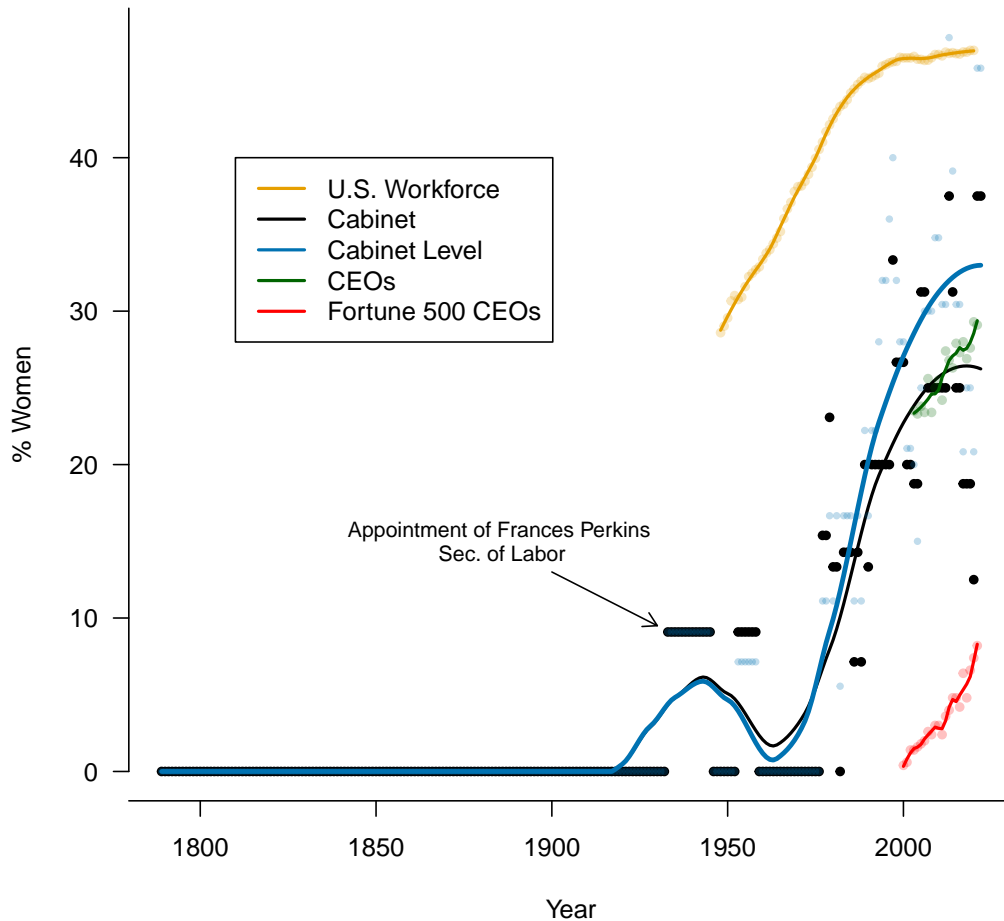
4.2 Partisan Dynamics in Women's Representation

Polling consistently shows partisan differences in perceptions of women's representation, and the importance placed on it (Menasce Horowitz, Parker and Stepler, 2017; Menasce Horowitz and Igielnik, 2020). This raises the question of whether women's representation in the executive branch varies with the political party occupying the White House.

Indeed, Figure 2 shows the recency of growth in women's representation in the executive branch tracks closely with the party in power. The bottom time series in the plot shows the percent of top-tier posts in federal agencies held by women over time (pooling employees across all agencies), i.e. posts requiring U.S. Senate confirmation.[9] While the share of women top-tier employees has increased markedly from about 2% in the Nixon administration to 23% in the Trump administration, reaching a peak in Obama's second term of approximately 35%, the series also shows relative decreases in women's representation at the top levels during Republican administrations.[10]

In addition to partisan trends, Figure 2 also underscores that the rate at which women have made gains varies markedly across levels of the bureaucracy.[11] While the share of

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[9]Note: Vacant positions are excluded from the denominator in these calculations. In addition, both top-tier and rank and file panel data sets rely on data from the same agencies every year. However, the number of positions included in a given year varies. Analyses using only job titles appearing consistently in each agency throughout this time period produce highly similar conclusions. See Figure A1.

[10]Over this period, the share of women in top-tier roles is roughly 9.8 points lower among Republican administrations than among Democratic administrations, on average ($p < .01$).

[11]For the time series of top-tier positions, the figure displays the percent of women employees in each year. In some cases, more than one person holds the same post in the same year (e.g. if a person is replaced mid year). In those cases, all such individuals are

Figure 2: **Gender Representation in Federal Agencies Over Time.** The figure displays the percent of jobs in federal agencies held by women over time, separately for "top-tier" (Senate-confirmed) and rank and file positions. The percent of women holding jobs in the total U.S. workforce over the same period is displayed for reference. Horizontal red lines denote means of top-tier posts during each period of partisan control of the White House.
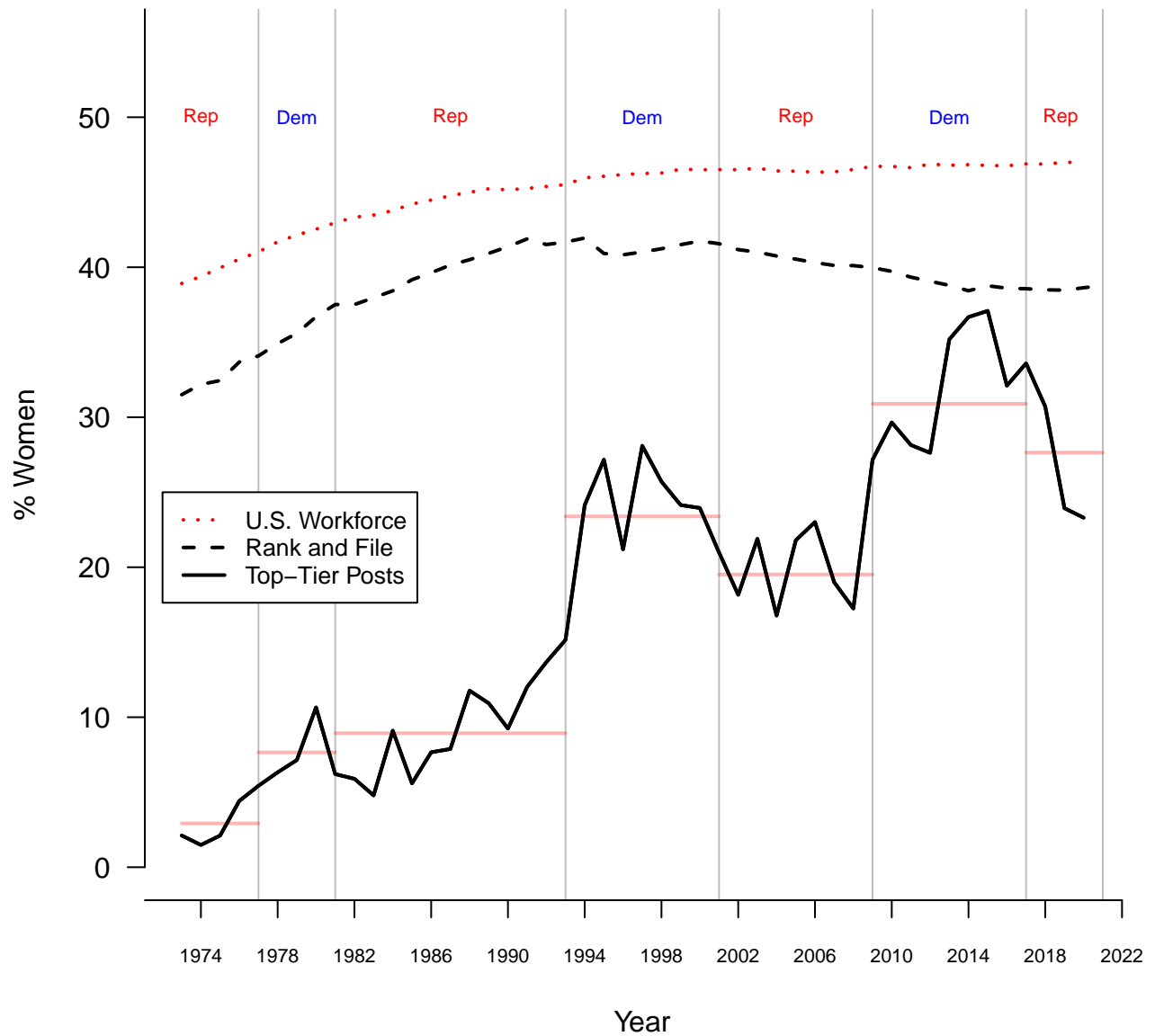
women serving in top-tier positions increased precipitously from the 1970s to 2020, the share of women serving in rank and file positions has remained relatively flat, increasing from about 32% in 1973 to about 40% by the 1980s and remaining there from 1990 to 2020. Put differently, while the number of women appointed to highly-visible and prestigious Senate-confirmed posts has increased, the share of women serving in the lower ranks of the bureaucracy has changed only modestly in close to fifty years. In fact, as the figure shows, the share of women in rank and file positions within the bureaucracy was roughly 8-percentage points lower than women's employment in the U.S. overall in 2020. This stagnation is likely due in part to the fact that rank and file posts tend to be occupied by career employees protected by civil service laws, limiting any one administration's ability to substantially change the composition of bureaucratic agencies.

The lack of growth in lower ranks may stymie the ascendance of women into prominent roles, since future leaders can be cultivated from these lower tiers.

5 Experimental Design

To isolate the effect of merely emphasizing women in government, absent the addition of any new women in government roles, we conduct an equivalence framing experiment in which respondents were randomly assigned to view brief mission statements copied from the web sites of four federal departments: Treasury, Defense, Education, or Health and Human Services. These agencies were chosen because previous scholarship has classified them as stereotypically "men's" or "women's" agencies (Potter and Volden, 2021). Each respondent was presented with information on all four agencies, which appeared in random order. By including a range of federal agencies, we can also ensure that our results are not an artifact of an idiosyncratic design choice. In our core analyses, we pool responses over

included in that year's denominator.

these four items.[12]

After reading a mission statement, respondents were randomly assigned with 1/8 proba-
bility to see no additional information (the pure control group), while all other respondents
were randomly assigned to view a version of the following statement: "In recent years,
about [X%] of the [jobs/top jobs] in this agency have been held by [women/men]," where
X was a "dose" randomly drawn from the set {20,30,40,50,60,70,80}. (See Appendix B.5
for examples of these various conditions.)[13] The gender and dose treatments were indepen-
dently randomized across the four items. Following each of the four items, all respondents
were asked (i) "How much confidence do you have that the U.S. [Agency Name] will fulfill
its mission?" and (ii) "How much confidence do you have that the U.S. [Agency Name]

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[12]Pooling in this way requires a "no carryover" assumption, e.g. that potential outcomes
remain stable across rounds of the experiment (Hainmueller and Yamamato, 2014). To
gauge robustness, we implemented a conservative test isolating our analysis to the first of
four items respondents saw, among respondents who were assigned to participate in the
equivalence framing experiment first on the survey instrument. Our core result is robust
to this approach; see Appendix Table B11. In addition, Appendix Table B10 estimates
these pooled effects separately by the order in which an item was viewed. Items viewed in
the third and fourth positions produced smaller treatment effects than items viewed in the
first position. However, results are robust to analysis of the first item in isolation: pooled
results estimated using only the first survey item show a gender effect of 6 and 3 points on
the women's interest and agency mission outcomes, respectively ($p < 0.05$ in both cases).

[13]Note: manipulating whether positions were described as "jobs" or "top jobs" had no
statistically significant effect on responses, both in isolation, and when interacted with the
gender treatment. See Appendix B.6 for details.

will represent the best interests of American women?" These items served as dependent variables in this experiment; responses were measured on four-point scales. These dependent variables allow us to test whether changes in emphasis on the gender composition of agencies alters perceptions of substantive representation for women, while intentionally leaving vague the definition of high quality government service. We do this to account for the possibility that respondents hold varied views on these matters.[14] Our item can therefore measures the relevant perception *however defined by a particular respondent*.[15]

The primary quantity of interest in this experiment can be written as:

$$\tau_x = E[Y|X = x\%, G = \text{``women''}] - E[Y|100 - (X = x\%), G = \text{``men''}] \tag{1}$$

where Y is a dependent variable, X is a randomly assigned percentage (treatment dose), and G is the randomly assigned gender of the federal employees being described. We expect that τ_x will be positive, especially among women and Democrats relative to men and Republicans, respectively. That is, we expect participants to respond more positively when the percentage women, x, is stated than when the percentage men, (100-x), is stated, despite the fact that these convey essentially equivalent information. We underscore that because equivalence framing designs convey logically equivalent information while merely

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[14]The question formulation "represents the best interests of women" is standard in public opinion surveys, and has typically been used to gauge which presidential candidate or party is perceived to better serve women. For examples see (Gallup, 1990; Magazine, 1992; Foundation, 2012).

[15]The item asking about the agency's ability to fulfill its mission was asked first in this sample. In a pilot study, the order of these outcomes was randomized. We found no evidence treatment effects varied with item order; see Appendix Table B12.

varying which aspects of that information are highlighted, they represent among the most precise tests of counterfactuals, and are recognized as superior to so-called "emphasis framing" experiments which also vary content, clouding interpretations (Scheufele and Iyengar, 2012).

5.1 Experimental Sample

Our survey sample was collected by the vendor Qualtrics in January 2022 with a sampling strategy designed to hit national benchmarks for gender and race/ethnicity, and to include roughly 1/3 Democrats, 1/3 Republicans and 1/3 Independents (with partisan leaners counted as Independents for sampling purposes, but coded as partisans for all analyses below). As a result, our survey sample closely mirrors the U.S. population on standard variables. All respondents saw information on all four agencies in the framing experiment, though the order in which agencies were presented, and the information on gender composition that was conveyed about each agency, was fully randomized.[16]

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[16]Note: this instrument contained two other experiments, though the order of all experiments was randomized across respondents. We omit discussion of these experiments in the main text to focus on the experiment that precisely tests our central hypothesis concerning the effects of rhetorical emphasis on gender diversity in government. See Appendix B.8 for details on the design and results of these additional experiments. See Appendix Section B.7 for an investigation into order-induced heterogeneity in results. See Appendix B.1 for details on sample demographics, sampling procedures, and information participant compensation and ethical considerations.

6 Results

Table 1 displays results pooled across levels of randomly assigned gender compositions (i.e. pooling over the randomly assigned values from the set {20%, 30%, 40%, 50%, 60%, 70%, 80%}), and pooled across the four agencies described to each respondent.[17] Relative to conditions where statistics convey the percentage of jobs held by men, conveying logically equivalent statistics in terms of percent women led to responses that were 4.5 percentage points higher on a measure of confidence that the agency would represent women's best interests, about 16% of one standard deviation of this variable in the pooled sample. This shift corresponds to respondents moving further from the "Not too much confidence" toward the "Some confidence" levels of the original survey items, on average. Model (2) tests for heterogeneity in this effect by the respondent party ID, but finds none, contrary to expectations. However, as model (3) shows, the effect of the "women" condition on male survey respondents was 2.8 percentage points ($p < 0.05$), while the effect among women was 3.2 percentage points higher, a significant difference in effects ($p < 0.05$).

Models (4)-(6) show a similar pattern when asking about perceived mission fulfillment. In the pooled sample, emphasizing women boosted this measure by 1.9 percentage points ($p < 0.05$). We note this effect hinges on the randomized order in which respondents participated in the multiple experiments on our survey, which all concerned gender and government. We interpret this result as suggestive evidence that some framing effects depend on the broader context of the conversation surrounding gender diversity in government, e.g. when the topic has first been made salient in an initial discussion, framing

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[17]The coefficient on the gender treatment in this pooled regression is equivalent to a weighted average of the within-cell differences in responses (e.g. the difference between the 80%men/20%women cell, 70%men/30%women cell, etc.) across all doses.

effects on certain outcomes may be larger. We discuss these issues further in Appendix Section B.7. Effects on this second outcome were highly similar across partisan groups of respondents. The effect among men was near zero, while the effect among women was 2.1 percentage points higher ($p < 0.05$).

Merely emphasizing the share of federal jobs held by women rather than men boosted perceptions that government would attend to women's interests, and be more efficacious in general, despite both conditions conveying essentially equivalent information. While this effect was not pronounced among Democrats, it was higher among women than men. In addition, Appendix Table B3 shows results from models that condition on the agency being described, pooled across doses. The results show that the pooled effects displayed above occur at similar levels across all agencies for models estimating confidence that women's interests will be well represented. However, for models estimating confidence in mission fulfillment, we find significantly larger effects of the gender treatment when the agency being described is Education, HHS or Treasury rather than the Dept. of Defense ($p < 0.05$ these differences in effects relative to DOD). We speculate this stems from stereotypes associated with women's abilities in defense and foreign policy (Koch and Fulton, 2011).

While these pooled effects supply a succinct high-level summary, they mask varioation across doses of the treatment. Figure 3 shows the average responses to the item measuring confidence that an agency will substantively represent American women, separately for each gender condition and randomly assigned percentage (the mean response in the control condition, in which no information on gender composition was conveyed, and accompanying 95% confidence intervals is plotted in orange for reference). Within each level of the dose-response experiment, the gaps between the red and blue estimates show that respondents receiving logically equivalent information on the gender composition of government

Table 1: **Effects of Gender Treatment in Dose Response Experiment.** The table below shows average treatment effects of emphasizing women (relative to men) in the dose response experiment pooled across all doses. Models (1) and (4) show average effects in the entire sample. Models (2)-(3) and (5)-(6) condition on respondent party and gender, respectively. Standard errors in parentheses, clustered by respondent.

| | *Dependent variable:* | | | | | |
| | Represent Women | | | Fulfill Mission | | |
	(1)	(2)	(3)	(4)	(5)	(6)
condition: control	0.004	−0.005	0.006	−0.012*	−0.022**	−0.009
	(0.006)	(0.010)	(0.009)	(0.006)	(0.010)	(0.010)
condition: women	0.045***	0.034***	0.028***	0.019***	0.011*	0.009
	(0.004)	(0.007)	(0.006)	(0.004)	(0.007)	(0.006)
Independent		−0.044***			−0.021*	
		(0.011)			(0.011)	
Democrat		0.058***			0.113***	
		(0.009)			(0.008)	
control * Indepdenent		−0.003			0.018	
		(0.018)			(0.018)	
women * Independent		0.020*			0.015	
		(0.012)			(0.012)	
control * Democrat		0.021			0.013	
		(0.014)			(0.014)	
women * Democrat		0.017*			0.013	
		(0.009)			(0.009)	
female respondent			−0.048***			−0.021***
			(0.008)			(0.008)
control * female			−0.006			−0.007
			(0.013)			(0.013)
women * female			0.032***			0.021**
			(0.008)			(0.008)
(Intercept)	0.537***	0.521***	0.561***	0.561***	0.518***	0.572***
	(0.004)	(0.006)	(0.006)	(0.004)	(0.006)	(0.006)
Observations	20,684	20,684	20,684	20,684	20,684	20,684

| Note: | | | | | | *p<0.1; **p<0.05; ***p<0.01 |

agencies reported discernibly different perceptions of substantive representation depending on which gender was emphasized. (These gaps correspond to the sample analogue of τ_x from Equation 1. See Appendix Figures B10-B11 And Tables B4-B7 for estimates of τ_x.)

Specifically, framing information in terms of percent men produces lower assessments than the control condition when percentages convey an extremely lopsided gender composition (80% men, or 70% men). However, for all other levels, the "men" framing information essentially elicits responses in line with those in the control condition—where no information on gender is provided—while respondents in the "women" condition reported statistically significantly higher levels of confidence (relative to the "men" condition) that the agency would represent women's interests in all cases but the 60% men/40% women stratum. Once percentages rise to 50% or above, the women treatment causes responses to climb high above the pure control condition. Overall, this pattern shows that, relative to the control, these framing effects are mostly positive responses to the emphasis on women, rather than negative reactions to emphasis on men. In fact, mean responses to being told an agency is only 20 and 30% women are statistically indistinguishable from conditions conveying that men occupy 50% or jobs or less, which imply higher shares of women.

We see a similar but more muted pattern in Figure 4, which displays average confidence the agency will fulfill its mission. Relative to the percent "men" condition, statistically significant differences emerge once percentages exceed 50% women. Emphasizing women not only increases confidence that government will be attentive to women's interests, but that it will be more competent in general. Results show consistent support for our central prediction, but effect sizes are modest. However, our manipulation is more subtle than many presidential communications on diversity in government in press events.[18]

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[18]These results closely mirror pilot results; see Appendix B.11.

Figure 3: **Equivalence Frame Experiment: Perception Agency Will Represent Women's Interests.** The figure displays mean responses in the equivalence framing experiment (shapes are point estimates; bars are 95% confidence intervals). Respondents were told about an agency's mission and then given either no information on the agency's gender composition (control), told the agency was "$X\%$ men", or told the agency was "$(100\text{-}X)\%$ women", where X is a randomly drawn value from $\{20,30,40,50,60,70,80\}$. As the figure shows, presenting information on gender composition in terms of "% women" rather than "% men" leads to higher confidence that the agency will best represent women's interests, on average, despite the fact that the information is logically equivalent.
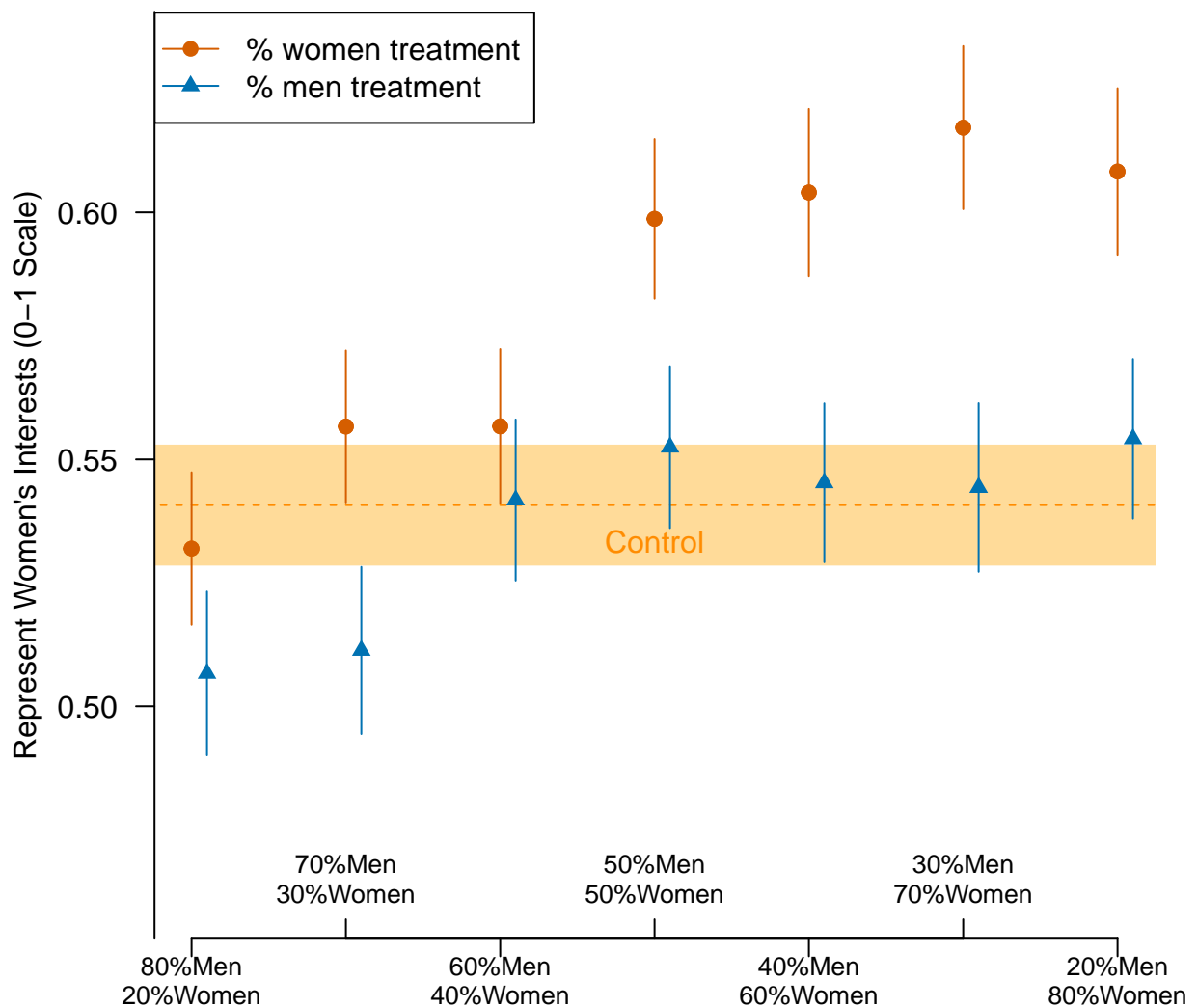
Figure 4: **Equivalence Frame Experiment: Perception Agency Will Fulfill its Mission.** The figure displays mean responses in the equivalence framing experiment (shapes are point estimates; bars are 95% confidence intervals). Respondents were told about an agency's mission and then given either no information on the agency's gender composition (control), told the agency was "$X\%$ men", or told the agency was "$(100\text{-}X)\%$ women", where X is a randomly drawn value from $\{20,30,40,50,60,70,80\}$. As the figure shows, presenting information on gender composition in terms of "% women" rather than "% men" leads to higher confidence that the agency will fulfill its mission, on average, despite the fact that the information is logically equivalent.
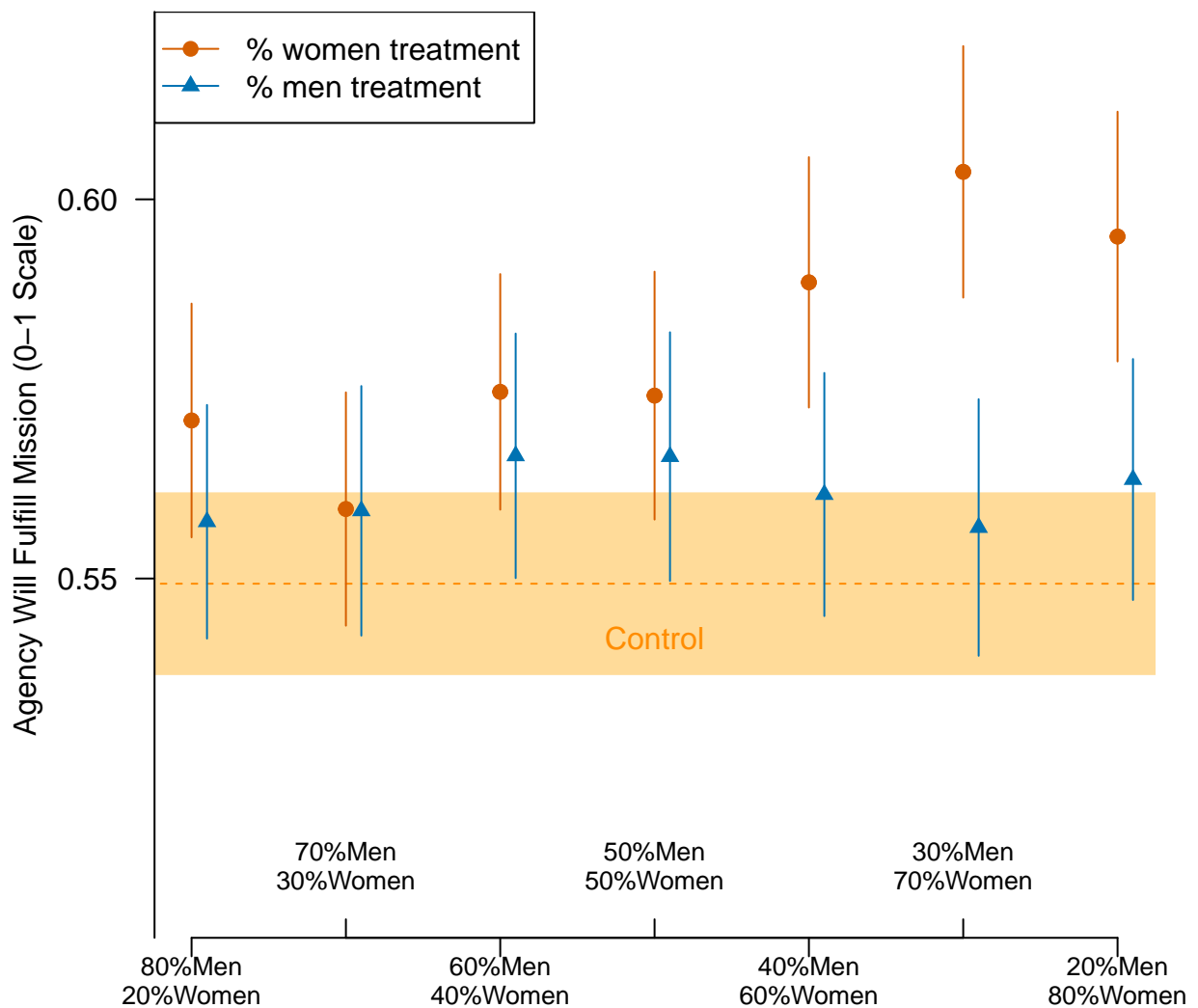
7   Conclusion

Rhetoric on the importance of gender diversity is now commonplace in national political discourse. After centuries of nearly all male government, women have made rapid gains in assuming top federal posts, including the vice presidency, and presidents from both parties now extol the benefits of having women in positions in power. Despite this rhetoric, women remain severely underrepresented at multiple levels of the federal bureaucracy, and as our analysis shows, their advancement has been uneven, and slowed in part by Republican presidents who tend to appoint fewer women than their immediate Democratic predecessors. In a world where women remain underrepresented in positions of power, how do individuals respond to information emphasizing the presence of women, however few, in government posts?

We theorized that in this environment, emphasis on even a small number of women in positions of power is perceived, in the parlance of Kahneman and Tversky, as a "gain," especially among groups favoring gender diversity. This perception may be strengthened by an inference that women who manage to overcome their historical exclusion are more competent than their male counterparts, all else equal, (though testing this particular aspect of the mechanism is beyond the scope of this paper; (Anzia and Berry, 2011).[19]

Our experimental results are consistent with this account. Specifically, we show that when arbitrary emphasis is placed on the presence of women in government, i.e. the share of a federal agency's jobs held by women (as opposed to men), perceptions of substantive representation of women can be altered. These altered perceptions can arise even absent any commitments or changes that advance women's welfare or level of representation. In line

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[19]Future work could test whether information on the historical exclusion of women alters perceptions of the competence of women who attain government posts.

with our predictions based on the well-known connection between the personal relevance of information and issue salience, these effects are most pronounced among women, who are likely the intended target of this brand of strategic communication.

These effects raise the possibility that voters can be misled by communications about diversity in government, however well-intentioned those communications might be. Likewise, for the cynical politician, these effects demonstrate an opportunity to engage in cheap talk, boosting perceptions that a group is being substantively represented by government without achieving any tangible representational gains. Similar to publicly traded companies that engage in "diversity washing," obtaining higher environmental, social and governance ratings by discussing DEI initiatives in their public disclosures rather than increasing racial and gender diversity through hiring, opportunistic politicians may appeal to voters by simply mentioning members of an underrepresented group (Baker et al., 2022).

There are several possible avenues to extend this line of research. Like all experiments, ours takes place in a particular context and it is possible that changes to this context could lead to very different results. In particular, framing effects depend on the "availability, accessibility, and applicability" of frames to citizens who consume them (Amsalem and Zoizner, 2022). At the time of data collection, the occupant of the Oval Office was a Democrat, which means respondents may have processed gender-related treatments pertaining to the staffing of the bureaucracy in ways that, for example, would have differed under the Trump Administration (e.g. appeals of this sort may have appeared more or less sincere based on the parties' reputations). Future iterations of these experiments during other periods in time, or across contexts which vary in terms of partisan control, could help to investigate this possibility. Adding partisan manipulations to the experimental design would also help to probe the conditional impact of emphasizing gender in this way.

Dynamic experiments which randomize counter-messaging efforts from out-party members could also help to gauge whether the impact of such appeals can be easily neutralized or reversed. Relatedly, a limitation of our study is that it does not account for how the media environment may condition the framing effects we demonstrate. The volume and character of the coverage of political communications conveying information on gender diversity could alter the effect of those communications. In future work, it may be useful to present this information in the context of a news article, perhaps one that varies in its partisan slant, to investigate this possibility. Descriptive work on media coverage of these statements would also allow for a better understanding of the reach of these messages.

Finally, though we focus on gender diversity in this paper, the patterns we document have potential implications for the study of other facets of diversity in government, including representation based on race, class, religion and sexual orientation. For example, previous studies have shown that White Americans overestimate racial progress toward economic equality (Kraus, Rucker and Richeson, 2017; Callaghan et al., 2021). It is possible that spotlighting government employees of color is contributing to similar misperceptions in terms of substantive representation. Further, discussions of intersectional government officials may elicit wholly different perceptions, especially if overlapping identities are made explicit in political communications (Crenshaw, 1991; Minta and Brown, 2014; Reingold, 2022). Future work could apply the framework we have developed here to study perceptions of how government prioritizes other segments of society.

8   Acknowledgments

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9   Biographical Statement

Lauren Wright is an associate research scholar and lecturer in Politics and Public Affairs at Princeton University, at Princeton University, Princeton, N.J. 08544. Jonathan Mummolo is an associate professor of Politics and Public Affairs at Princeton University, Princeton, N.J. 08544. Madeline Marr is an independent scholar.

Appendix

Table of Contents

A Administrative Data

A.1 Sources and Composition of Panel Data

As we note in Section 3 of the paper, our analysis of rank and file and top-tier positions within executive branch agencies relies on government Handbooks and Plum books. These books are published every four years and include all presidentially-appointed positions within the federal government. Presidentially-appointed positions requiring Senate confirmation represent the leadership ranks of each agency as well as leaders of the internal offices, bureaus, divisions, and services within them. In order to obtain the names of people serving in these roles in the intervening years between four-year intervals, we also used

the United States Government Manuals, which are official handbooks of the Federal Government published each year in a special edition of the Federal Register. The handbooks include the names of officials heading major operating units in the executive branch of U.S. government.[20]

These books do not always provide complete information. For example, we are forced to exclude the Department of Energy from our analysis in 1981, a year in which the U.S. Government Manual was missing pages containing a personnel directory for that department. Our data analysis is also affected by the life cycles of agencies. For example, The Department of Health and Human Services first enters our panel in 1980, several months after the Department of Education Reorganization Act removed the education portions of the Department of Health, Education and Welfare (DHEW). (Prior to 1980, we include DHEW in both the top-tier and rank and file data sets; subsequently, HHS and Education replace this agency.) Similarly, the Department of Homeland Security enters our panel data in 2003, the first year in which rank and file data become available for that agency. While changing composition in a panel data set can sometimes cloud interpretation, we are confident the broad trends we discuss in the main text are robust, since an alternative analysis restricted only to top-tier positions that survive the entire period of 1973-2020 shows highly similar patterns (see Figure A1 below). We code top-tier positions based on Plum books for years 1996 through 2020, which can be accessed on The U.S. Government Publishing Office (GPO) website here: https://www.govinfo.gov/collection/plum-book?path=/GPO/United%20States%20G overnment%20Policy%20and%20Supporting%20Positions%20%2528Plum%20Book%2529. To access earlier years of the Plum Books, we used HathiTrust's digital library of GPO documents: https://babel.hathitrust.org/cgi/mb?a=listis;c=1512554095.

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[20]U.S. Government manuals for years 1935-2021 can be accessed on the GPO's website here: https://www.govinfo.gov/app/collection/govman.

A.2 Validating Gender Coding

To validate the gender identities of top-tier employees based on first names, we randomly sampled 100 observations and used web searches to locate mentions of pronouns and honorifics in public documents mentioning each official. We located pronouns and/or honorifics for 99 of the 100 observations, one of which was miscoded (accuracy = 98/99). We could not locate informative documents on Harold M. Grindle, who served as a U.S. Marshal in Iowa in 1977, who we code as a man. In cases where a man and a woman served in the same position in a given year, the position was coded as being filled by a woman. There are 81 of these cases across all years in our data set, which, excluding vacancies, roughly comprises 23,000 total observations.

A.3 Additional Results

Figure A1: **Gender Representation in Federal Agencies Over Time Using Common Positions.** The figure replicates Figure 2 using only the 152 top-tier job titles that existed in each agency every year of the panel (roughly 5,400 observations).
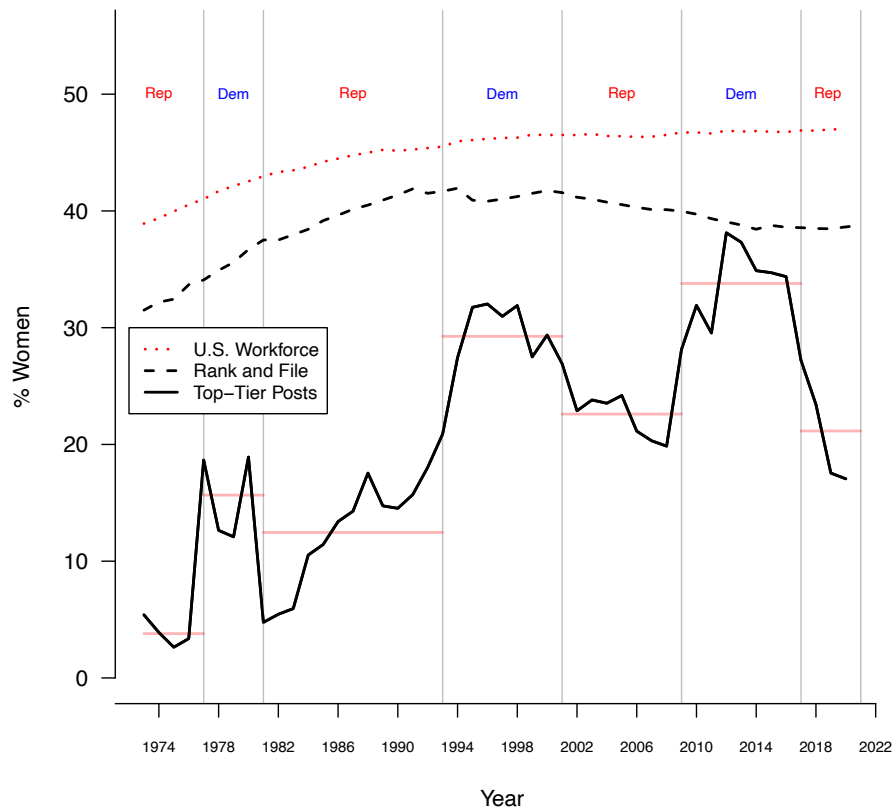
B Survey Experiment

B.1 Sampling Procedure, Compensation and Ethical Considerations

Survey respondents contacted by Qualtrics were screened: with an attention check (displayed in Figure B1), and for age (over 18), and gender (men and women only, as pilot samples indicated a lack of statistical power to study other gender identities). Qualtrics also purged respondents who exhibited "speeding" behavior, completing the survey in less than 1/3 the median completion time as measured in the initial soft launch.

At the start of the survey, an introduction screen was displayed stating that this survey was part of a research project. It also provided information on the topic of the survey, informed respondents that their participation was voluntary and of the study's risks, and provided contact information for the study's authors and university officials. Identifying information on survey respondents was not collected.

Our equivalence framing experiment involves minor deception, which was necessary to evaluate how participants would respond to hypothetical gender compositions of federal agencies. All respondents were debriefed at the conclusion of the survey as to the nature of, and reason for, any inaccurate information conveyed; see Figure B9.

To determine levels of compensation for participants, we aimed to meet or exceed the current federal minimum wage, which is $7.25/hour. In a pilot study conducted on the platform Prolific, we compensated respondents at a rate equivalent to $14.12 per hour. The main survey sample used in our analysis was collected by the survey firm Qualtrics, which charged us $4 per complete response. The mean completion time for this survey was 6.47 minutes, which translates to $37.05 per hour. However, like all survey firms, Qualtrics directly compensates participants without our involvement, and we do not control what portion of that money is received by participants.

Table B1: **Demographics of Experimental Sample**. The table displays descriptive statistics of respondents in our experimental sample relative to the U.S. population. National Party ID statistics are from the 2020 American National Election Studies. Partisan leaners coded as partisans. All other national data are recent U.S. Census estimates.

Variable	Sample (%)	U.S. (%)
Female	50%	50%
Age (median years)	41	38
At Least BA	37%	34%
Hispanic	12%	18%
Non-Hispanic White	66%	60%
Non-Hispanic Black	12%	12%
Non-Hispanic Asian	5%	6%
Other Race	5%	4%
Democrat	42%	46%
Republican	41%	42%
Independent	18%	12%
N	5,171	

B.2 Pre-Analysis Plan

The pre-registration of the experiments we conducted via Qualtrics was submitted on January 9, 2022, prior to the start of data collection. It includes a description of sampling procedures, hypotheses and a plan for analysis, and is available here: https://aspredicted.org/nm4pk.pdf. We note one error in the pre-analysis plan, which states that all randomizations in the equivalence framing experiment were fully independent across both respondents and survey items. This is true with the exception of the "job"/"top jobs" randomization, which was only randomized between respondents but remained fixed across each respondent's four items. This does not affect key tests, since the gender treatment assignment was orthogonal to the jobs treatment assignment by design.

B.3 Gender as a Non-binary Construct

While the logic of our equivalence framing experiment invokes a binary construct of gender (i.e. men and women are assumed to sum to 100%), we stress that gender identity is not restricted in this way generally (Hyde et al., 2019), and need not remain fixed within persons over time (Galupo, Pulice-Farrow and Ramirez, 2017). However, we invoke this binary framework due to several features of the specific context under study. Our experiment is based on the categorizations which appear in federal data on employee gender, which do account for transgender identities. Specifically, the Office of Personnel Management's (OPM) guidelines for keeping records pertaining to the personal information of employees, including gender identity, states that the category "men" includes transgender men, and the category "women" includes transgender women. These records are regularly updated to ensure they accurately reflect the gender identity of government employees who may have transitioned after starting to work for the federal government.[21] The remainder of employees are classified as 'unspecified,' but this accounts for far less than 1% of employees, and it can refer to missing or inconsistent data, not necessarily non-binary identity. To a first approximation, describing federal employees as being comprised of men and women is consistent with available (but admittedly, imperfect) administrative data.

B.4 Descriptive Statistics

Table B2: **Distribution of Outcome Variables in Equivalence Framing Experiment.** Note, variables originally coded on a 1-4 scale; re-scaled here to range between 0 and 1. A value of 0 corresponds to "No confidence at all", 0.33 corresponds to "Not Too Much Confidence", 0.67 corresponds to "Some Confidence", and 1 corresponds to "A lot of confidence" on the original scales.

	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.	Std. Dev.
Agency Fulfill Mission	0.00	0.33	0.67	0.57	0.67	1.00	0.28
Agency Represent Women	0.00	0.33	0.67	0.56	0.67	1.00	0.29

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[21]See here for more details on this policy: https://www.opm.gov/policy-data-oversight/diversity-and-inclusion/reference-materials/guidance-regarding-employment-of-transgender-individuals-in-the-federal-workplace.pdf

B.5   Survey Content

Figure B1: Attention Check

People are very busy these days and many do not have time to follow what goes on in the government. We are testing whether people read questions. To show that you've read this much, answer both "extremely interested" and "very interested."

- ☐ Extremely interested
- ☐ Very interested
- ☐ Moderately interested
- ☐ Slightly interested
- ☐ Not interested at all

Figure B2: Nominee Experiment Treatment Text

White House: President to nominate Alex Smith to lead ${e://Field/exp2_agency}

WASHINGTON — The president will nominate Alex Smith as the next Secretary of the ${e://Field/exp2_agency}, the White House announced. ${e://Field/title} Smith is an expert in ${e://Field/policy} policy and has previously served in various high-level leadership positions in the federal government.

A ${e://Field/parent} of two, ${e://Field/title} Smith resides in Arlington, Virginia.

"Life is changing faster than at any point in human history," ${e://Field/pronoun1} said in a statement. "As a nation, we face a choice: shape the world around us, or get shaped by it. We cannot hide from the future."

Figure B3: Nominee Experiment Dependent Variables

How much confidence do you have in Alex Smith's ability to effectively lead the ${e://Field/exp2_agency}?

No confidence at all	Not too much confidence	Some confidence	A lot of confidence
○	○	○	○

After reading about the announcement of Alex Smith, how much confidence do you have in the president's ability to fill the government with qualified and responsive public servants?

No confidence at all	Not too much confidence	Some confidence	A lot of confidence
○	○	○	○

Figure B4: Equivalence Framing Experiment: Dept. of Defense Treatment

The mission of the U.S. Department of Defense is to provide the military forces needed to deter war and ensure our nation's security.

In recent years, about ${e://Field/pct_dose_dod}% of ${e://Field/rank} in this agency have been held by ${e://Field/exp_1_gender_dod}.

Figure B5: Equivalence Framing Experiment: Dept. of Treasury Treatment

The mission of the U.S. Department of Treasury is to maintain a strong economy and create economic and job opportunities by promoting the conditions that enable economic growth and stability at home and abroad, strengthen national security by combating threats and protecting the integrity of the financial system, and manage the U.S. Government's finances and resources effectively.

In recent years, about ${e://Field/pct_dose_treas}% of ${e://Field/rank} in this agency have been held by ${e://Field/exp_1_gender_treas}.

Figure B6: Equivalence Framing Experiment: Dept. of Education Treatment

The mission of the U.S. Department of Education is to promote student achievement and preparation for global competitiveness by fostering educational excellence and ensuring equal access.

In recent years, about ${e://Field/pct_dose_educ}% of ${e://Field/rank} in this agency have been held by ${e://Field/exp_1_gender_educ}.

Figure B7: Equivalence Framing Experiment: Dept. of Health and Human Services Treatment

The mission of the U.S. Department of Health and Human Services is to enhance the health and well-being of all Americans, by providing for effective health and human services and by fostering sound, sustained advances in the sciences underlying medicine, public health, and social services.

In recent years, about ${e://Field/pct_dose_hhs}% of ${e://Field/rank} in this agency have been held by ${e://Field/exp_1_gender_hhs}.

Figure B8: Equivalence Framing Experiment: Dependent Variables. (Note: Agency names in these items matched the agency respondents read about immediately prior, but were otherwise identical. Items measuring confidence in the Dept. of Defense displayed below as an example.)

How much confidence do you have the U.S. Department of Defense will fulfill its mission?

No confidence at all   Not too much confidence   Some confidence   A lot of confidence
○   ○   ○   ○

How much confidence do you have that the U.S. Department of Defense will represent the best interests of American women?

No confidence at all   Not too much confidence   Some confidence   A lot of confidence
○   ○   ○   ○

Figure B9: **Debrief at conclusion of survey.**

Thank you for participating in this survey. Please note the information about the gender composition of federal agencies was not necessarily accurate. Hypothetical numbers were supplied in order to test whether different gender compositions affected perceptions of government.

Please feel free to leave any comments or feedback below.

B.6 Additional Experimental Results

Table B3: **Treatment Effects by Dose, Interacted with Agency and Rank.**

	Dependent variable:					
	Represent Women			Fulfill Mission		
	(1)	(2)	(3)	(4)	(5)	(6)
condition: control	0.004	0.005	0.005	−0.012*	0.007	−0.019**
	(0.006)	(0.013)	(0.009)	(0.006)	(0.012)	(0.009)
condition: women	0.045***	0.030***	0.037***	0.020***	−0.012	0.016***
	(0.004)	(0.008)	(0.006)	(0.004)	(0.008)	(0.006)
Rank: 'top jobs'	0.004	0.004	−0.003	0.004	0.004	−0.001
	(0.007)	(0.007)	(0.008)	(0.006)	(0.006)	(0.008)
Agency: Education	−0.006*	−0.013*	−0.006	−0.091***	−0.106***	−0.091***
	(0.004)	(0.007)	(0.004)	(0.004)	(0.007)	(0.004)
Agency: HHS	0.0002	−0.010	0.0004	−0.068***	−0.082***	−0.068***
	(0.004)	(0.007)	(0.004)	(0.004)	(0.007)	(0.004)
Agency: Treasury	−0.014***	−0.023***	−0.013***	−0.075***	−0.092***	−0.075***
	(0.004)	(0.007)	(0.004)	(0.004)	(0.007)	(0.004)
control * Education		−0.009			−0.036**	
		(0.018)			(0.018)	
women * Education		0.018			0.047***	
		(0.012)			(0.012)	
control * HHS		0.003			−0.017	
		(0.018)			(0.018)	
women * HHS		0.022*			0.036***	
		(0.012)			(0.012)	
control * Treasury		0.006			−0.020	
		(0.018)			(0.017)	
women * Treasury		0.020*			0.043***	
		(0.012)			(0.012)	
control * Rank: 'top jobs'			−0.001			0.015
			(0.013)			(0.013)
women * Rank: 'top jobs'			0.016*			0.007
			(0.009)			(0.008)
Constant	0.539***	0.546***	0.543***	0.618***	0.629***	0.620***
	(0.006)	(0.007)	(0.006)	(0.005)	(0.007)	(0.006)
Observations	20,684	20,684	20,684	20,684	20,684	20,684

Note: *p<0.1; **p<0.05; ***p<0.01

Figure B10: **Equivalence Frame Effects on Perception Agency Will Represent Best Interests of Women.** The plot below displays estimates of the difference in average responses between the percent men and percent women condition across doses of the experiment, i.e. estimates of τ_x from Equation 1 in the main text.
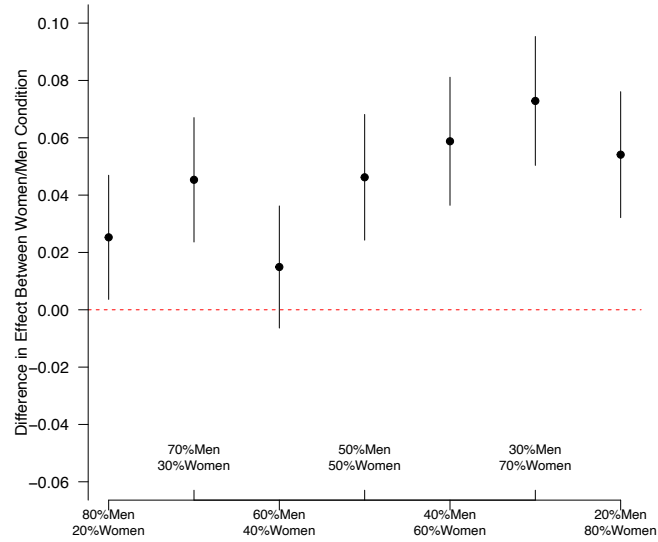
Figure B11: **Equivalence Frame Effects on Perception Agency Will Fulfill Mission.** The plot below displays estimates of the difference in average responses between the percent men and percent women condition across doses of the experiment, i.e. estimates of τ_x from Equation 1 in the main text.
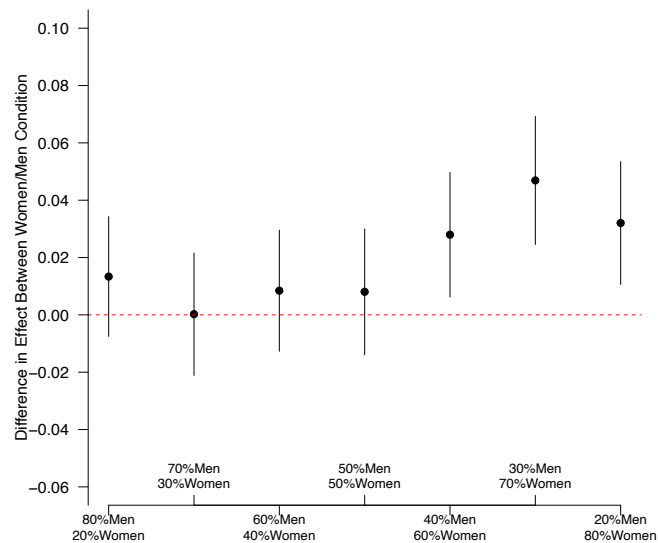
Table B4: **Treatment Effects by Dose, Interacted with Respondent Gender: Agency will Represent Women's Interests**. Column labels indicate percent men / percent women among respondents in each model. Coefficient on 'women' condition indicates effect of providing information on percent women relative to a logically equivalent message about percent men.

	Dependent variable:						
	Represent Women						
	80/20	70/30	60/40	50/50	40/60	30/70	20/80
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
condition: women	0.027*	0.055***	0.017	0.038**	0.010	0.030*	0.021
	(0.016)	(0.016)	(0.016)	(0.016)	(0.015)	(0.017)	(0.016)
female respondent	−0.033**	−0.035**	−0.061***	−0.041**	−0.053***	−0.064***	−0.045***
	(0.016)	(0.017)	(0.016)	(0.017)	(0.017)	(0.017)	(0.017)
women * female respondent	0.054**	0.037	0.083***	0.013	0.010	0.029	0.009
	(0.022)	(0.023)	(0.023)	(0.022)	(0.022)	(0.022)	(0.022)
(Intercept)	0.570***	0.562***	0.576***	0.574***	0.568***	0.545***	0.529***
	(0.011)	(0.012)	(0.012)	(0.013)	(0.011)	(0.013)	(0.012)
Observations	2,564	2,540	2,572	2,574	2,673	2,577	2,619

Note: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Table B5: **Treatment Effects by Dose, Interacted with Respondent Gender: Agency will Fulfill Mission**. Column labels indicate percent men / percent women among respondents in each model. Coefficient on 'women' condition indicates effect of providing information on percent women relative to a logically equivalent message about percent men.

|	*Dependent variable:*						
	Agency Fulfill Mission						
	80/20	70/30	60/40	50/50	40/60	30/70	20/80
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
condition: women	0.002	0.021	0.015	−0.001	0.011	−0.007	0.021
	(0.016)	(0.017)	(0.017)	(0.017)	(0.015)	(0.016)	(0.016)
female respondent	−0.020	−0.029*	−0.016	−0.028*	−0.021	−0.017	−0.015
	(0.016)	(0.017)	(0.016)	(0.017)	(0.016)	(0.017)	(0.016)
women * female respondent	0.060***	0.055**	0.026	0.016	−0.005	0.014	−0.015
	(0.022)	(0.023)	(0.022)	(0.022)	(0.022)	(0.022)	(0.021)
(Intercept)	0.573***	0.571***	0.569***	0.581***	0.577***	0.568***	0.565***
	(0.011)	(0.012)	(0.012)	(0.012)	(0.012)	(0.013)	(0.011)
Observations	2,564	2,540	2,572	2,574	2,673	2,577	2,619

Note: *p<0.1; **p<0.05; ***p<0.01

Table B6: **Treatment Effects by Dose, Interacted with Respondent Party: Agency will Represent Women's Interests**. Column labels indicate percent men / percent women among respondents in each model. Coefficient on 'women' condition indicates effect of providing information on percent women relative to a logically equivalent message about percent men.

	Dependent variable:						
	Represent Women						
	80/20	70/30	60/40	50/50	40/60	30/70	20/80
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
condition: women	0.063***	0.062***	0.053***	0.033*	−0.004	0.017	0.016
	(0.017)	(0.018)	(0.018)	(0.017)	(0.017)	(0.017)	(0.017)
Independent	0.0003	−0.056**	−0.034	−0.041*	−0.058**	−0.070***	−0.048**
	(0.023)	(0.024)	(0.023)	(0.024)	(0.023)	(0.024)	(0.023)
Democrat	0.089***	0.089***	0.096***	0.046**	0.048***	0.015	0.020
	(0.018)	(0.019)	(0.018)	(0.018)	(0.018)	(0.019)	(0.019)
women * Independent	−0.042	0.066**	−0.011	0.001	0.049	0.048	0.025
	(0.032)	(0.032)	(0.033)	(0.032)	(0.031)	(0.031)	(0.031)
women * Democrat	0.003	−0.004	0.015	0.032	0.022	0.047*	0.012
	(0.024)	(0.025)	(0.025)	(0.024)	(0.024)	(0.024)	(0.024)
(Intercept)	0.517***	0.520***	0.511***	0.540***	0.532***	0.518***	0.507***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Observations	2,564	2,540	2,572	2,574	2,673	2,577	2,619
Note:						*p<0.1; **p<0.05; ***p<0.01	

Table B7: **Treatment Effects by Dose, Interacted with Respondent Party: Agency will Fulfill Mission**. Column labels indicate percent men / percent women among respondents in each model. Coefficient on 'women' condition indicates effect of providing information on percent women relative to a logically equivalent message about percent men.

	Dependent variable:						
	Agency Fulfill Mission						
	80/20	70/30	60/40	50/50	40/60	30/70	20/80
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
condition: women	0.032*	0.036**	0.029	0.006	0.007	−0.027	−0.004
	(0.018)	(0.018)	(0.018)	(0.017)	(0.017)	(0.017)	(0.017)
Independent	0.013	−0.039	−0.004	−0.019	−0.015	−0.064***	−0.017
	(0.023)	(0.024)	(0.023)	(0.023)	(0.023)	(0.024)	(0.022)
Democrat	0.121***	0.123***	0.140***	0.129***	0.116***	0.074***	0.087***
	(0.017)	(0.019)	(0.017)	(0.018)	(0.018)	(0.018)	(0.017)
women * Independent	−0.040	0.056*	−0.029	0.004	0.012	0.071**	0.030
	(0.031)	(0.032)	(0.032)	(0.032)	(0.031)	(0.031)	(0.030)
women * Democrat	0.025	0.003	0.006	0.007	−0.005	0.038	0.027
	(0.023)	(0.025)	(0.024)	(0.024)	(0.023)	(0.024)	(0.023)
(Intercept)	0.509***	0.515***	0.503***	0.514***	0.521***	0.540***	0.525***
	(0.013)	(0.014)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Observations	2,564	2,540	2,572	2,574	2,673	2,577	2,619

Note: *p<0.1; **p<0.05; ***p<0.01

B.7 Analysis of Heterogeneity Based on the Ordering

Our research designs and multiple samples of data allow us to test whether the order in which respondents engaged with experiments, and the order in which they answered key questions, affected the magnitude of treatment effects.

B.7.1 Order of Experiments

The order of experiments in our survey modules was randomized across respondents, allowing us to test whether participating in one experiment first affected treatment effect estimates in subsequent experiments. All participants engaged in three experiments: the nominee experiment, the equivalence framing experiment (the subject of the main text), and an experiment testing visual methods of communicating trends in gender representation, discussed in Section B.8.

First, we tested in our Qualtrics sample whether our core result in the equivalence framing experiment—that communications emphasizing the share of women working in an agency boost perceptions that the agency will represent womens' interests—was robust to the order of experiments. We find that it is. Specifically, Table B8 shows the effect of emphasizing women (relative to men) among respondents who saw the framing experiment first was a 3 percentage-point increase in confidence that the agency will represent women's interests ($p < .05$). Among respondents who saw the cabinet nominee experiment first, the effect increased further by 3.2 percentage points ($p < .05$). In other words, our main claim of a positive and significant effect on this outcome holds regardless of experiment order, though to varying degrees.

Experiment order was more consequential when estimating effects on perceptions the agency will fulfill its mission (column 2). Specifically, we estimate the effect of emphasizing women as a share of agency employees (relative to men) is a statistically insignificant 0.7 percentage points ($p = 0.36$) when the framing experiment is presented first. When the nominee experiment is presented first, the effect grows by a statistically significant 2.6 pp.. We conclude this result is less generalizable than our core finding, since it appears to hinge

in part on initial discussion of a cabinet nominee.

Table B8: **Effect of Experiment Order on Treatment Effects in Framing Experiment.** Omitted category is condition presenting framing experiment first in the survey instrument.

	Dependent variable:	
	Represent Women	Agency Fulfill Mission
	(1)	(2)
condition: control	−0.018	−0.028**
	(0.011)	(0.011)
condition: women	0.030***	0.007
	(0.007)	(0.007)
nominee experiment first	−0.023**	−0.017*
	(0.010)	(0.010)
visualization experiment first	−0.027***	−0.032***
	(0.010)	(0.010)
control*nominee first	0.032**	0.031*
	(0.016)	(0.016)
women*nominee first	0.033***	0.026**
	(0.011)	(0.010)
control*visualization first	0.034**	0.017
	(0.016)	(0.016)
women*visualization first	0.013	0.013
	(0.010)	(0.010)
Constant	0.553***	0.577***
	(0.007)	(0.007)
Observations	20,684	20,684
Note:	*p<0.1; **p<0.05; ***p<0.01	

Further, the plots below display the results broken out by individual dose levels of the treatment separately for respondents who saw either the resume or framing experiment first.

In nearly every case, point estimates for the condition emphasizing women are higher than in the condition emphasizing men. While these gaps are not always statistically significant due to the large loss of statistical power that results from subsetting by survey version, these results are strongly consistent with our original and central conclusion, regardless of the order in which experiments were presented.

As noted above, while the interaction terms in Table B8 indicate that our main finding holds regardless of experiment order, treatment effects did vary depending on experiment order. However, Table B9 shows we saw so such order effects in our pilot experiment, which was conducted on the platform Prolific.

Table B9: **Pilot Experiment: Robustness Check for Order Effects.** Effects of Gender Treatment in Dose Response Experiment conditional on order in which experiment was presented in survey using Prolific sample. No pure control condition was included in this version of the experiment.

	Dependent variable:	
	Represent Women	Fulfill Mission
	(1)	(2)
condition: women	0.076***	0.039***
	(0.014)	(0.013)
nominee first	−0.007	0.005
	(0.015)	(0.013)
visualization first	−0.029*	−0.032**
	(0.015)	(0.014)
women * nominee first	0.016	0.013
	(0.020)	(0.019)
women * visualization first	−0.006	−0.010
	(0.021)	(0.019)
(Intercept)	0.478***	0.554***
	(0.011)	(0.009)
Observations	4,307	4,307
Note:	*p<0.1; **p<0.05; ***p<0.01	

Figure B12: **Effects Among Respondents who saw equivalence framing experiment first in survey.** Qualtrics sample.
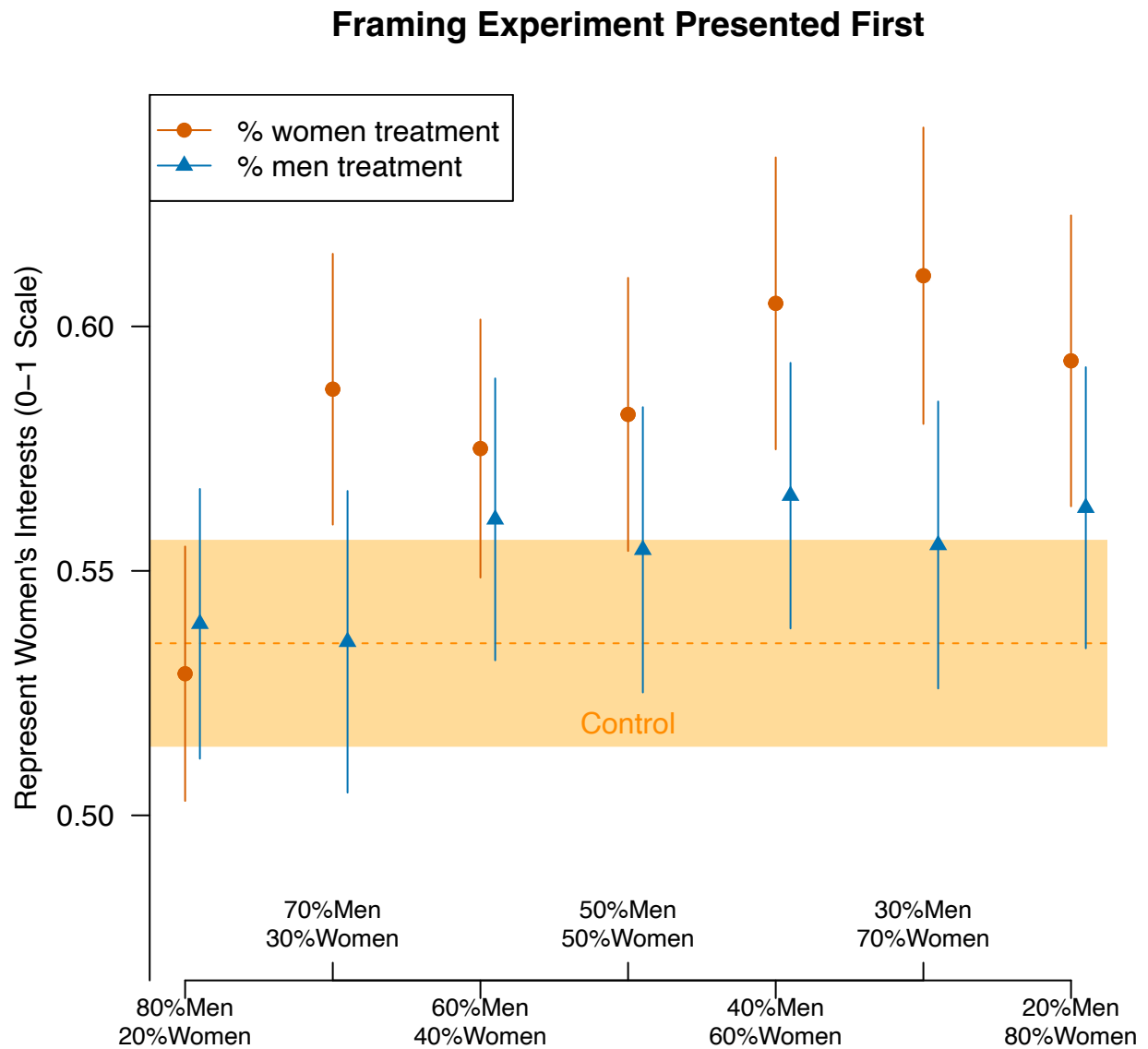

Framing Experiment Presented First

Figure B13: **Effects Among Respondents who saw nominee experiment first in survey.** Qualtrics sample.

Figure B14: **Effects Among Respondents who saw visualization experiment first in survey.** Qualtrics sample.
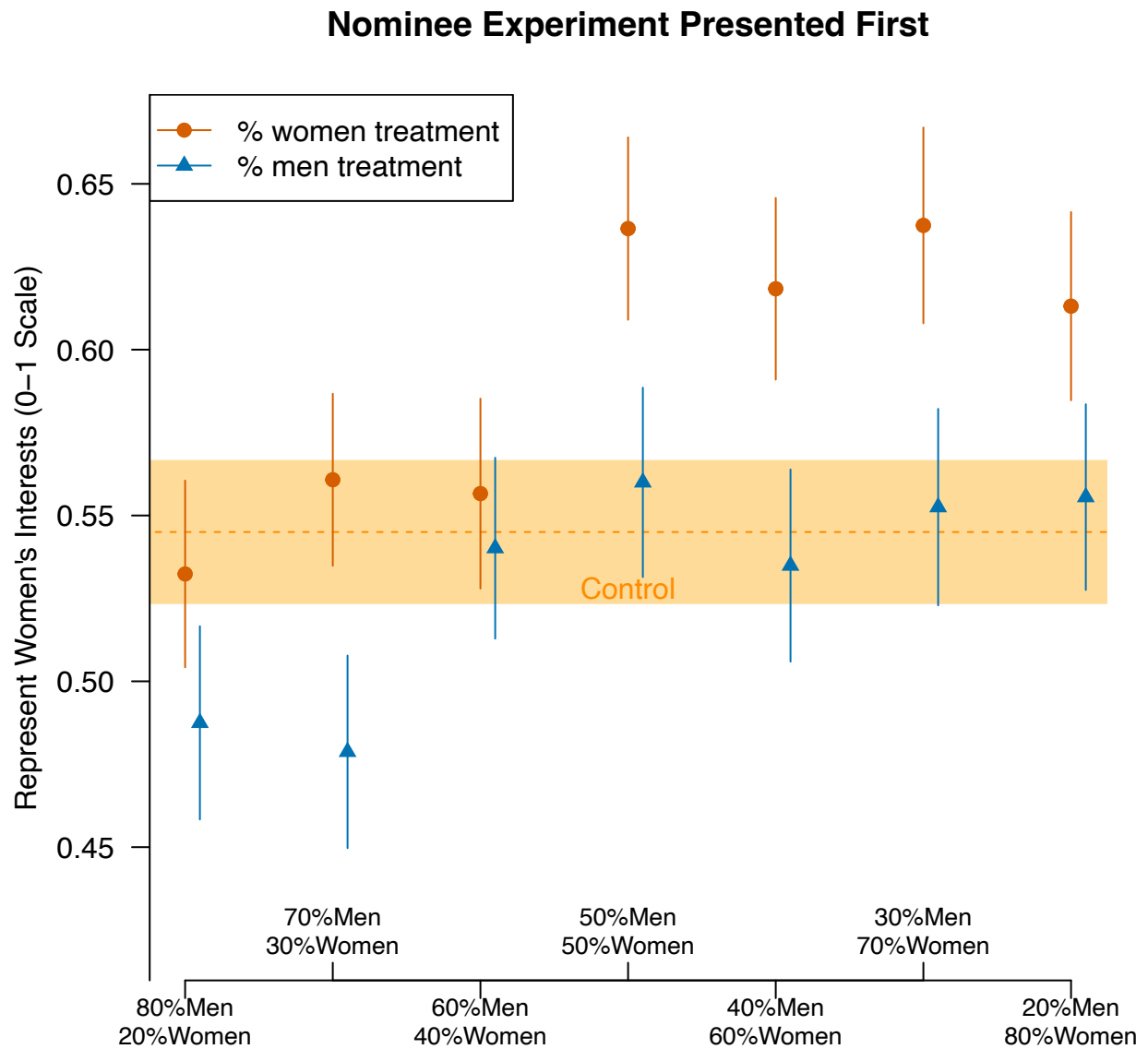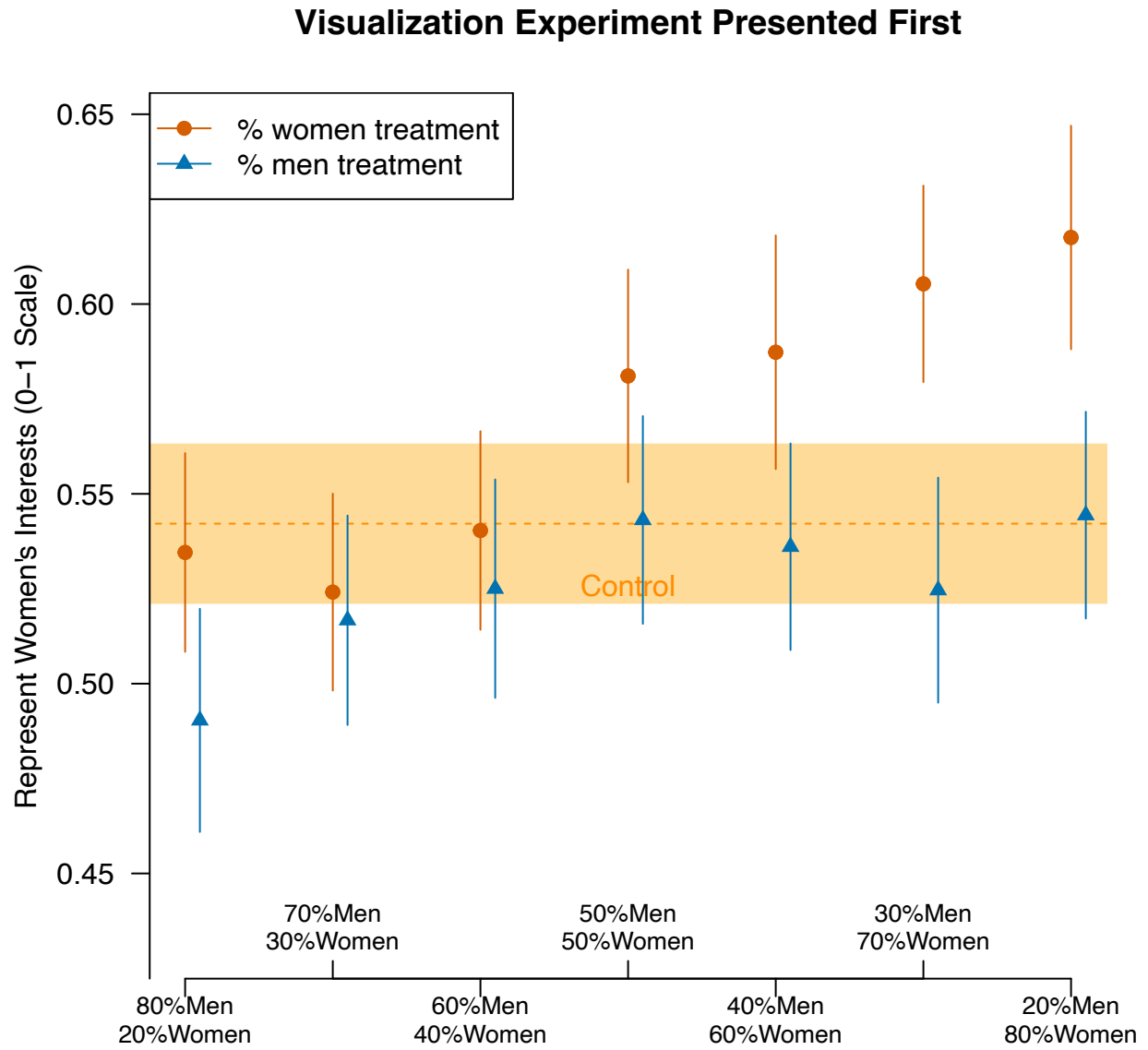

Visualization Experiment Presented First

B.7.2 Order of Survey Items

Recall that in the equivalence framing experiment in our main sample, respondents received gender composition information about four agencies in random order, and responded to questions measuring dependent variables after each one. Pooling these responses represents an average treatment effect over the four cases, but we can also explore whether effects change during the course of this four-module experiment (e.g., we can test for the existence of carryover effects).

First, Table B10 shows treatment effects conditional on the order in which an agency was presented. The table shows that the effect of framing information in terms of percent women on our main outcome (column 1) is a statistically significant 6 pp. for responses to the first agency presented. This effect does not discernibly vary relative to when agencies are presented second, but shrinks by between 2 and 4 percentage points if we restrict analysis to cases where an agency appears in the third and fourth positions, respectively.

To make sure this heterogeneity is not responsible for our core conclusion, Table B11 shows the results of a very conservative test in which we subset to: 1) respondents who participated in the equivalence framing experiment first and 2) observations corresponding to the first agency they were asked about within this experiment. Our core result is robust to this conditioning. Specifically, in this truncated sample, the effect of emphasizing women's share of an agency causes a four-point boost in perceptions that the agency will look after women's interests ($p = .004$).

We can also use our pilot experiment to test whether the order in which items measuring our dependent variables were presented affects results (while this order was fixed in our main analysis, it randomly varied in our pilot experiment.) Table B12 shows that treatment effects did not vary based on this ordering.

We also tested for heterogeneity based on experiment order in the treatment effects from an experiment testing preferences for a female vs. male cabinet nominee, detailed in Section B.8. The results, detailed in the next section, show significant heterogeneity based on experiment order. We interpret the heterogeneity in both experiments as suggestive

Table B10: **Condition on order in which agencies were presented.** Effects of gender treatment in dose response experiment.

	Dependent variable:	
	Represent Women	Fulfill Mission
	(1)	(2)
condition: control	0.025**	0.007
	(0.012)	(0.012)
condition: women	0.060***	0.032***
	(0.008)	(0.008)
Order: 2	0.014*	0.002
	(0.007)	(0.007)
Order: 3	0.026***	0.010
	(0.007)	(0.007)
Order: 4	0.033***	0.004
	(0.007)	(0.007)
control * Order: 2	−0.022	−0.028
	(0.018)	(0.018)
women * Order: 2	−0.001	−0.002
	(0.012)	(0.012)
control * Order: 3	−0.027	−0.032*
	(0.018)	(0.018)
women * Order: 3	−0.024**	−0.025**
	(0.012)	(0.012)
control * Order: 4	−0.034*	−0.016
	(0.018)	(0.018)
women * Order: 4	−0.037***	−0.025**
	(0.012)	(0.012)
(Intercept)	0.518***	0.558***
	(0.006)	(0.006)
Observations	20,684	20,684
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table B11: **Robustness Check for Order Effects: Effects of Gender Treatment in Dose Response Experiment.** Estimates limited to the first of four items viewed by respondents, among respondents randomly assigned to participate in dose response experiment first in the survey instrument. Seeing the framing experiment first is the omitted reference category.

	Dependent variable:	
	Represent Women	Fulfill Mission
	(1)	(2)
condition: control	−0.0001	−0.008
	(0.022)	(0.022)
condition: women	0.042***	0.007
	(0.014)	(0.014)
(Intercept)	0.533***	0.576***
	(0.010)	(0.010)
Observations	1,737	1,737
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table B12: **Pilot Experiment: Effect of Order of DVs on Treatment Effects.**

	Dependent variable:	
	Represent Women	Agency Fulfill Mission
	(1)	(2)
condition: women	0.078***	0.045***
	(0.012)	(0.011)
fulfill mission asked first	−0.031***	0.012
	(0.012)	(0.011)
women*fulfill mission asked first	0.001	−0.010
	(0.017)	(0.016)
Constant	0.482***	0.539***
	(0.008)	(0.008)
Observations	4,307	4,307
Note:	*p<0.1; **p<0.05; ***p<0.01	

evidence that the effects of information concerning gender diversity in government vary with the context in which appeals regrading gender diversity is being made. Both analyses are consistent with the notion that such effects are more pronounced after the subject of gender has been made salient in an ongoing discussion, a dynamic that could be investigated in future work.

B.8   Additional Experiments

B.9   Is There a General Preference for Women Cabinet Members?

Our survey instrument also included an experiment to assess the baseline question of whether women are preferred to men to lead federal agencies on average, especially among women and Democrats. To do this, we employ a vignette design in which a hypothetical press release is presented to survey respondents describing a presidential nominee to lead a federal agency (randomly assigned to be either Defense, Treasury, HHS or Education). All the details of the announcement are held constant, including the nominee's name, "Alex Smith," but respondents were randomly assigned to receive a version with either masculine or feminine pronouns/titles throughout (e.g. "[Ms./Mr.]"; "a [mother/father] of two"; and "[she/he] said in a statement."). All conditions also state that the nominee is "an expert in [security/economic/health/education] policy," with the subject of expertise jointly assigned with the agency (e.g. expertise in "security" displayed to respondents viewing the Dept. of Defense condition). Importantly, this design improves upon prior work that signals gender based on varying first names (Moss-Racusin et al., 2012). With our design, names, which may unintentionally convey alternate traits like race or class, are held constant, providing a cleaner manipulation of the concept of interest. To encourage exposure to treatment, this press release was displayed for 30 seconds before participants were allowed to advance in the survey.

Following the press release, respondents were asked two items which served as dependent

variables: (i) "How much confidence do you have in Alex Smith's ability to effectively lead the [Agency Name]" and (ii) "After reading about the announcement of Alex Smith, how much confidence do you have in the president's ability to fill the government with qualified and responsive public servants?" Both items were measured on four-point scales. Our pre-registered hypotheses in this experiment were that participants would respond more positively on both items to the version of the press release describing a woman nominee, and that this effect would be pronounced among women and Democrats. The primary quantity of interest in this experiment is the average difference in responses between conditions using feminine pronouns relative to masculine pronouns.

Table B13 displays the results of the nominee experiment testing whether men or women Cabinet nominees are preferred. The first three columns of the table display the effects of providing feminine pronouns in the press release relative to male pronouns on how much confidence respondents had that the nominee would be effective in this position. Model (1) shows that the average treatment effect of this manipulation in the pooled sample is a 4 percentage-point increase ($p < 0.05$). This result is consistent with a recent meta-analysis of 67 candidate conjoint experiments which estimate a 2-point premium for women when running for elected office (Schwarz and Coppock, 2022). Model (2) interacts treatment with indicators of respondents' party identification (Republicans are the omitted category). The results show that among Republicans, the pronoun treatment has a statistically insignificant 1.5 percentage-point effect, but that among Democrats, the effect grows by 4.9 percentage points, a difference in effects that is statistically significant ($p < 0.05$). Effects among Independents were not statistically distinguishable from effects among Republicans. Model (3) interacts treatment with an indicator for survey respondents identifying as women. The results show that among male respondents, feminine pronouns caused a statistically insignificant 1.7 percentage-point increase in confidence, while the effect among women respondents is 4.7 percentage points larger, a statistically significant difference in effects ($p < 0.05$).

Columns (4)-(6) model effects on confidence that, based on this press release, the pres-

ident will staff the government with "qualified and responsive public servants," and shows a highly similar pattern of results. In the pooled sample (column (4)), feminine pronouns cause a 2-point increase in confidence ($p < 0.05$). Column (5) shows the effect among Republicans is near zero ($p > 0.05$), but is 4.4 percentage points larger among Democrats, a statistically significant difference ($p < 0.05$). The result is nearly identical when conditioning on respondent gender: the effect among men is near zero, but grows by 4.5 points among women, a statistically significant difference ($p < 0.05$).

In sum, the results of this experiment correspond closely with our pre-registered hypotheses: women are preferred to men for high-level executive positions, especially by women and Democrats.

While we find a clear preference for female nominees in the pooled sample, Table B15, shows these effects are neutralized when the nominee experiment appears first in the survey instrument.

Table B13: **Effects of Gender Treatment in Nominee Experiment.** The table below shows average treatment effects of using female pronouns relative to male in the nominee experiment pooled across all doses. Models (1) and (4) show average effects in the entire sample. Models (2)-(3) and (5)-(6) condition on respondent party and gender, respectively.

	Dependent variable:					
	Nom. Confidence			Nom. Confidence		
	(1)	(2)	(3)	(4)	(5)	(6)
condition: female pronouns	0.040***	0.015	0.017	0.021***	−0.003	−0.001
	(0.007)	(0.012)	(0.011)	(0.008)	(0.013)	(0.012)
Independent		−0.023			0.003	
		(0.015)			(0.016)	
Democrat		0.101***			0.168***	
		(0.011)			(0.011)	
female pronouns x Independent		0.039*			0.052**	
		(0.021)			(0.022)	
female pronouns * Democrat		0.049***			0.044***	
		(0.015)			(0.016)	
female respondent			0.00002			−0.007
			(0.010)			(0.011)
female pronouns * female respondent			0.047***			0.045***
			(0.014)			(0.016)
(Intercept)	0.603***	0.564***	0.603***	0.586***	0.515***	0.590***
	(0.005)	(0.008)	(0.007)	(0.005)	(0.009)	(0.008)
Observations	5,171	5,171	5,171	5,171	5,171	5,171

Note: *p<0.1; **p<0.05; ***p<0.01

Table B14: **Effects of Gender Treatment in Nominee Experiment by Agency.** The table below shows average treatment effects of using female pronouns relative to male in the nominee experiment conditioning on which agency respondents were assigned to read about.

	Dependent variable:	
	Nom. Confidence	Pres. Confidence
	(1)	(2)
condition: female pronouns	0.032**	0.012
	(0.015)	(0.015)
Agency: Education	0.017	0.007
	(0.014)	(0.016)
Agency: HHS	−0.004	0.017
	(0.014)	(0.016)
Agency: Treasury	−0.002	−0.011
	(0.014)	(0.015)
female pronouns * Education	−0.001	0.001
	(0.021)	(0.022)
female pronouns * HHS	0.023	0.009
	(0.021)	(0.022)
female pronouns * Treasury	0.011	0.023
	(0.021)	(0.022)
(Intercept)	0.600***	0.583***
	(0.010)	(0.011)
Observations	5,171	5,171
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table B15: **Effect of Experiment Order on Treatment Effects in Nominee Experiment.** Omitted category is condition presenting nominee experiment first in the survey instrument.

	Dependent variable:	
	Nom. Confidence	Pres. Confidence
	(1)	(2)
condition: feminine pronouns	0.013	0.008
	(0.013)	(0.014)
framing experiment first	0.002	0.005
	(0.013)	(0.014)
visualization experiment first	0.006	0.003
	(0.012)	(0.013)
feminine pronouns*framing first	0.065***	0.028
	(0.018)	(0.020)
feminine pronouns* visualization first	0.016	0.010
	(0.018)	(0.019)
(Intercept)	0.600***	0.584***
	(0.009)	(0.010)
Note:	*p<0.1; **p<0.05; ***p<0.01	

B.10 Visualization of Trends in Gender Diversity In Government

We also conducted an experiment designed to test whether various visualizations of gender composition in the executive branch changed perceptions of descriptive representation and government competence. To do this, we randomly assigned participants to view one of four versions of visualizations of data on gender composition over time similar to Figure 2 in the main text (omitting demarcations for presidential administrations and partisan labels) and accompanying text. However, across conditions, accompanying text was added to emphasize trends in women's representation vs. levels to varying degrees. Condition 1 (omitted as a reference category in the regressions in Table B16), portrayed a time series showing the share of women in top-tier government positions. The accompanying text emphasized changes over time, and read: "The plot below shows women's representation in top-tier jobs in federal agencies over time. As the plot shows, the share of top-tier jobs held by women was about 2% in 1973 and about 26% in 2020." Condition 2 featured the same time series with text that emphasized current levels over changes: "The plot below shows women's representation in top-tier jobs in federal agencies over time. As the plot shows, the share of top-tier jobs held by women was about 26% in 2020." Condition 3 added to the plot a time series showing the share of rank and file jobs held by women, and had accompanying text emphasizing current levels: "The plot below shows women's representation in federal agencies over time. The share of top-tier jobs held by women was about 26% in 2020. For reference, the share of rank and file jobs—that is, jobs not in the top tier— held by women was about 39% in 2020." Condition 4 further added the time series showing the share of the total U.S. workforce occupied by women over time, and had accompanying text emphasizing current levels: "The plot below shows women's representation in federal agencies over time. The share of top-tier jobs held by women was about 26% in 2020. For reference, the share of rank and file jobs—that is, jobs not in the top tier— held by women was about 39% in 2020. The share of jobs made up by women in the total U.S. workforce was 47% in the same year." The results of this analysis are displayed below. Our pre-registered hypotheses were that emphases on levels over changes would decrease perceptions

that women had adequate representation in government, and decrease perceptions that government was generally effective. As Table B16 shows, results showed mixed support for these hypotheses: relative to condition 1, condition 4, which was designed to maximize emphasis on levels over changes, caused a 2.2-point drop in perceptions of government efficacy, in line with our predictions ($p < 0.05$). However condition 4 also caused a 2.2-point increase in perceptions that women had adequate representation ($p < 0.05$). No other conditions yielded statistically significant results, and we saw no heterogeneity by respondent party and gender. In retrospect, we speculate that participants may have had difficulty interpreting visualizations of these statistics, but further refinement and testing is required. In addition, we subsequently improved the accuracy of our administrative data set which altered the trends visualized at the time this experiment was deployed. For these reasons, we omit the experiment from the main text, but discuss it here for the sake of transparency.

Table B16: **Effects of Emphasizing Levels over Trends in Government Statistics.** The table below shows average treatment effects of presenting data on gender composition in the executive branch in ways that emphasize levels over trends. Models (a) and (d) show average effects in the entire sample. Models (b)-(c) and (e)-(f) condition on respondent party and gender, respectively.

	Dependent variable:					
	Government Effective			Enough Women in Government		
	(1)	(2)	(3)	(4)	(5)	(6)
condition: 2	−0.004	0.002	−0.001	0.005	−0.016	0.010
	(0.011)	(0.017)	(0.016)	(0.009)	(0.013)	(0.012)
condition: 3	−0.021*	−0.004	−0.026	0.007	−0.012	0.006
	(0.011)	(0.017)	(0.016)	(0.009)	(0.013)	(0.012)

	(1)	(2)	(3)	(4)	(5)	(6)
condition: 4	−0.022**	−0.021	−0.013	0.022**	0.007	0.023*
	(0.011)	(0.017)	(0.016)	(0.009)	(0.013)	(0.012)
Independent		0.022			−0.058***	
		(0.022)			(0.016)	
Democrat		0.160***			−0.092***	
		(0.017)			(0.014)	
Condition 2 * Independent		−0.018			−0.0004	
		(0.030)			(0.022)	
Condition 3 * Independent		−0.036			0.009	
		(0.031)			(0.024)	
Condition 4 * Independent		0.008			−0.010	
		(0.031)			(0.022)	
Condition 2 * Democrat		0.0003			0.044**	
		(0.023)			(0.019)	
Condition 3 * Democrat		−0.016			0.036*	
		(0.023)			(0.019)	
Condition 4 * Democrat		0.003			0.035*	
		(0.023)			(0.019)	
female			−0.001			−0.052***

			(0.015)			(0.012)
Condition 2 * female			−0.006			−0.008
			(0.022)			(0.017)
Condition 3 * female			0.010			0.004
			(0.022)			(0.017)
Condition 4 * female			−0.019			−0.001
			(0.022)			(0.017)
(Intercept)	0.510***	0.437***	0.510***	0.369***	0.419***	0.394***
	(0.008)	(0.012)	(0.011)	(0.006)	(0.010)	(0.009)
Observations	5,171	5,171	5,171	5,171	5,171	5,171

Note: ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01

B.11 Additional Results from Pilot Study

We fielded a pilot study on the platform Prolific in December 2021. The results closely mirror the ones obtained from the results obtained via the vendor Qualtrics in January 2022. Below we present results from our piloted versions of the equivalence framing and nominee experiments. We omit pilot results for the visualization experiment since we do not rely on this study for any of our conclusions.

Figure B15: **Equivalence Frame Results in Pilot Study: Perception Agency Will Represent Best Interests of Women.** The figure displays mean responses in the equivalence framing experiment in our pilot study fielded on Prolific (shapes are point estimates; bars are 95% confidence intervals). Respondents were told about an agency's mission and then told the agency was "$X\%$ men", or told the agency was "$(100\text{-}X)\%$ women", where X is a randomly drawn value from $\{20,30,40,50,60,70,80\}$ (note: there was no pure control condition in this pilot version).
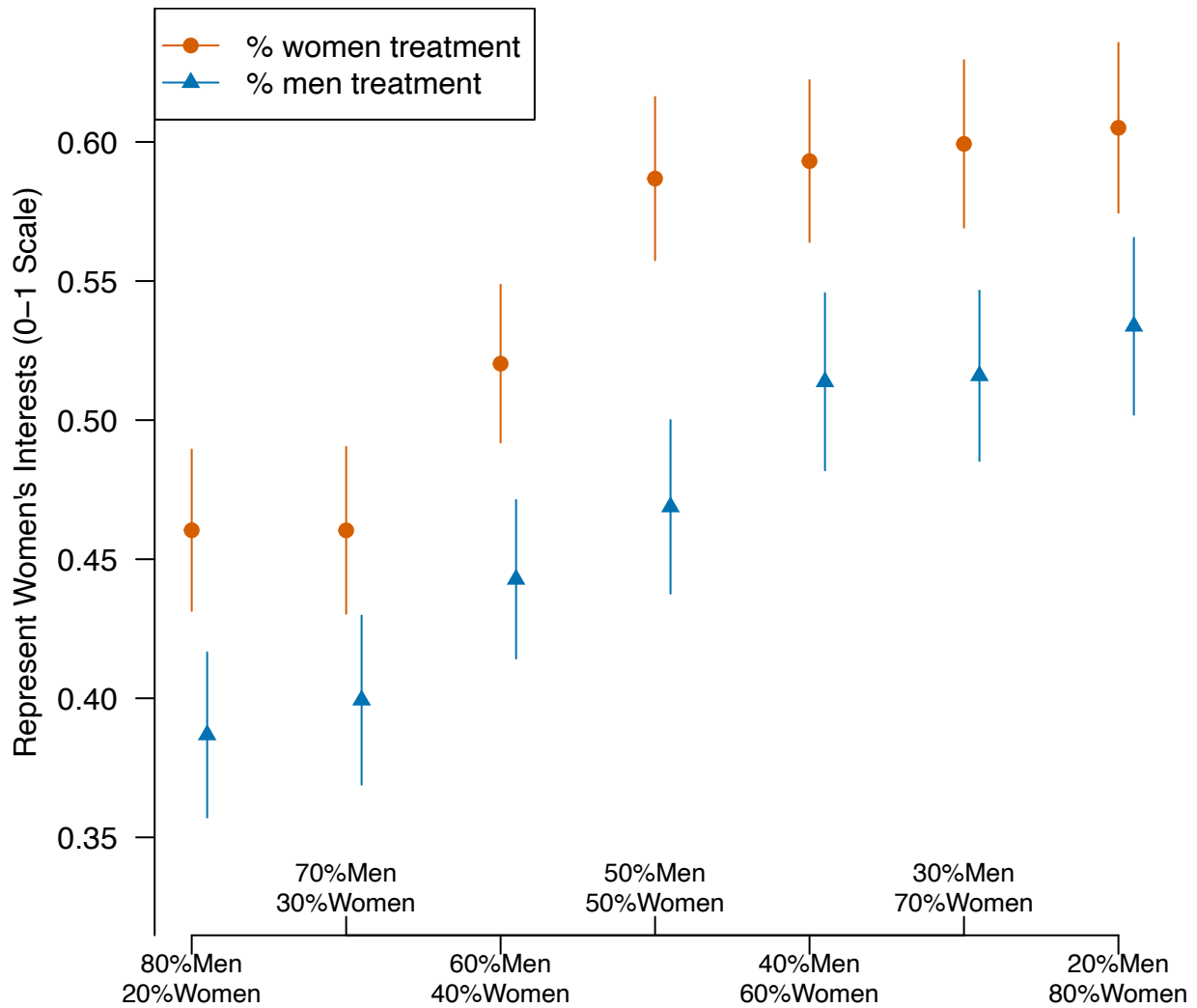
Figure B16: **Equivalence Frame Results in Pilot Study: Perception Agency Will Fulfill Its Mission.** The figure displays mean responses in the equivalence framing experiment in our pilot study fielded on Prolific (shapes are point estimates; bars are 95% confidence intervals). Respondents were told about an agency's mission and then told the agency was "$X\%$ men", or told the agency was "$(100\text{-}X)\%$ women", where X is a randomly drawn value from $\{20,30,40,50,60,70,80\}$ (note: there was no pure control condition in this pilot version).
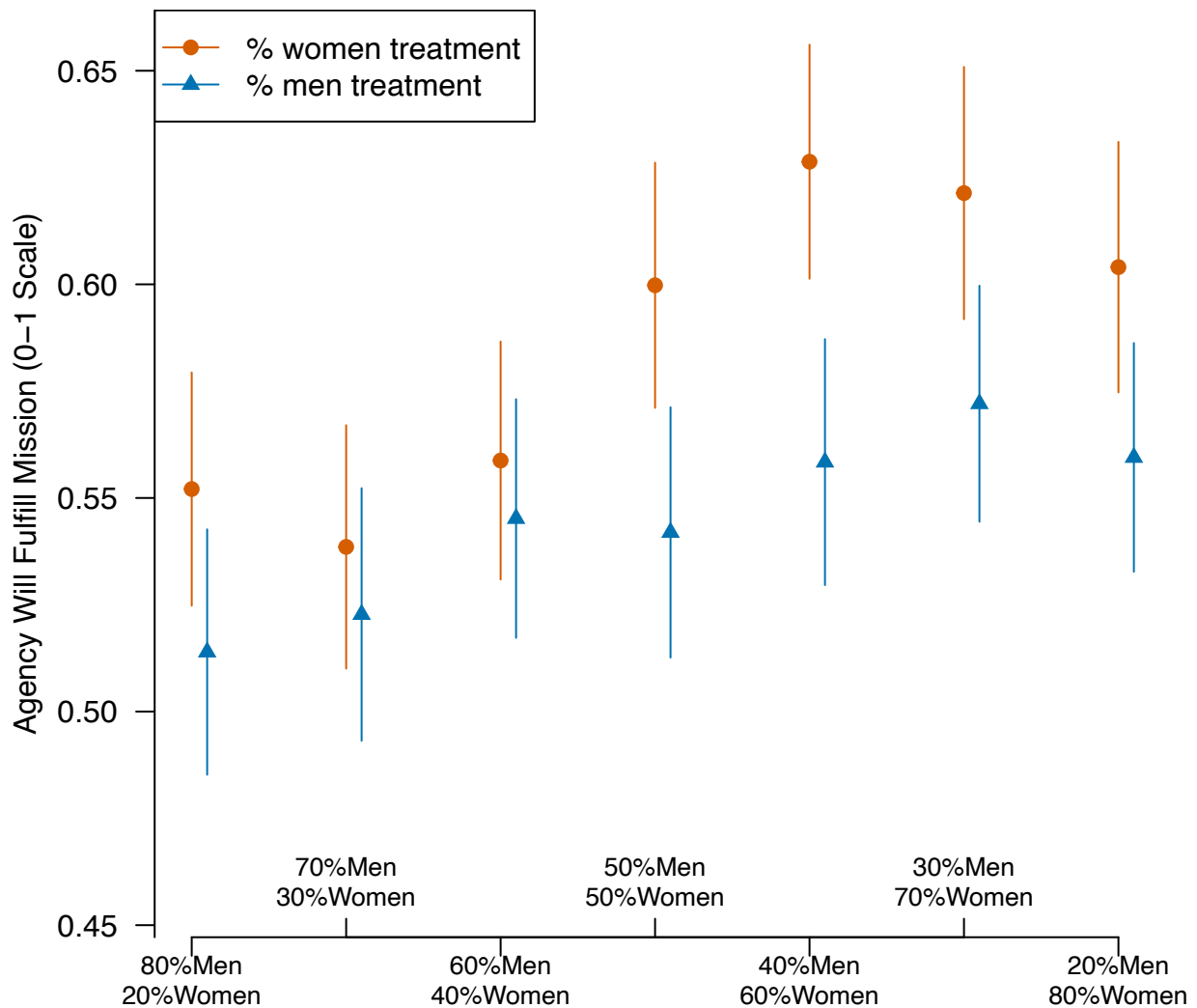
Table B17: **Pilot Study: Effects of Gender Treatment in Nominee Experiment.**
The table below shows average treatment effects of using female pronouns relative to male
in the nominee experiment pooled across all doses. Models (a) and (d) show average effects
in the entire sample. Models (b)-(c) and (e)-(f) condition on respondent party and gender,
respectively.

| | *Dependent variable:* | | | | | |
| | Nom Confidence | | | Pres. Confidence | | |
	(1)	(2)	(3)	(4)	(5)	(6)
condition: female pronouns	0.073***	0.019	0.054***	0.053***	−0.001	0.040***
	(0.007)	(0.017)	(0.010)	(0.007)	(0.018)	(0.011)
Independent		−0.064***			−0.056***	
		(0.019)			(0.020)	
Democrat		0.035***			0.071***	
		(0.013)			(0.014)	
female pronouns x Independent		0.042			0.052*	
		(0.026)			(0.027)	
female pronouns * Democrat		0.077***			0.075***	
		(0.018)			(0.020)	
female respondent			0.014			0.016
			(0.010)			(0.010)
female pronouns * female respondent			0.034**			0.024*
			(0.014)			(0.014)
(Intercept)	0.618***	0.604***	0.614***	0.609***	0.570***	0.603***
	(0.005)	(0.011)	(0.007)	(0.005)	(0.012)	(0.008)
Observations	4,307	4,304	4,228	4,307	4,304	4,228

Note:	*p<0.1; **p<0.05; ***p<0.01

41