# Female Empowerment and the Politics of Language:
## Evidence Using Gender-Neutral Amendments to Subnational Constitutions

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Benjamin J. Newman
School of Public Policy and
Department of Political Science
University of California, Riverside
bnewman@ucr.edu

Stephanie L. DeMora
Department of Political Science
University of California, Riverside
Stephanie.DeMora@email.ucr.edu

Tyler Reny
Department of Political Science
University of California, Los Angeles
ttreny@g.ucla.edu

This letter explores language politics as it concerns gender, and investigates the adoption of amendments which introduce gender-neutral language to subnational constitutions via popular initiative. Embracing theories of female empowerment based on resource acquisition and shrinking gender differentials in economic resources, we argue that popular support for these initiatives will be higher in contexts where female and male incomes are closer to parity. We test this expectation using city-level historical administrative data in California on Proposition 11 in 1974—the first American state to hold a popular vote on amending its constitution to include only gender-neutral language. We find that greater parity in income between women and men is associated with greater voter support for the initiative. This result holds after controlling for conceivable confounders, fails to emerge when analyzing gender-irrelevant ballot measures, and replicates when analyzing similar measures held in three additional jurisdictions.

## THE POLITICS OF GENDERED LANGUAGE

One longstanding debate over the politics of language concerns the use of gendered-language. Feminists have long argued that the linguistic use of "male-as-norm," or default to male in everyday language, reflects and upholds patriarchal systems and values (Martyna 1980; Onne 2008). One illustration of this is in the field of economics, where scholarship argues that the overwhelming representation of men and nearly exclusive utilization of male pronouns in prominent economics textbooks is reflective of the overall male-dominated nature of the discipline (Stevenson and Zlotnick 2018). Debate over gendered language has taken hold in the political arena, with myriad examples of policy interventions intended to correct the "male-as-norm" practice. For example, the passage of the Sex Discrimination Act (1975) in the U.K. required job advertisements replace gendered language with language that included both sexes (Cameron 2016). In New South Wales, Australia, a policy was introduced in 1983 that required

all further legislation to be written in gender-neutral terms, such as changing "he" or "she" to "they" (Larmour 1990; NSW 2000). In the United States, New York state passed legislation in 2018 that would officially change all instances of "policeman" or "fireman" to their gender-neutral equivalents (NY 2018) and the city of San Diego in 2016 shifted towards using gender-neutral language in communications from city employees (Starnes 2016).

Importantly, experimental research conducted in Estonia by Pérez and Tavits (2019) finds that usage of genderless language mitigates the use of negative stereotypes toward women, heightens support for policies that aid women's career development, and promotes support for the entry of women into national politics. Critically, Pérez and Tavits (2019) support their experimental findings in Estonia with analyses of cross-national observational data rendering correlations between use of genderless language and holding more egalitarian views concerning the role of women in business and government. Pérez and Tavits (2019) argue that their findings are due to gender-neutral language evoking a frame of mind where male and female objects are not distinguished, which in turn diminishes perception of inherent disparity between the sexes. Building on this, Tavits and Pérez (2019) conduct experiments in Sweden and find that the use of gender-neutral language reduces the salience of men, which in turn increases the recognition of, and demand for, female politicians in the Swedish national government. Complementing these works, a report issued by researchers at the World Bank finds that the use of gendered language throughout the world is associated with worse labor market outcomes for women and more regressive gender norms (Jakiela and Ozer 2018). This finding has far reaching implications, as the report indicates that roughly 38% of the world's population speak a gendered language.

The presence of research suggesting that the use of gendered language is economically and politically detrimental for women highlights the importance of political efforts promoting the

use of gender-neutral language. One central effort on this front has been amendments to government constitutions to replace gendered with gender-neutral language. These amendments seek to purge gender pronouns and other gendered words (e.g., "he", "his", "men") with terms such as "the governor," "the candidate," or "individuals". In the United States, for example, these types of amendments have been put to a popular vote in states and municipalities with direct democracy (The Associated Press 2003), with the seminal case being Proposition 11 in California in 1974. In fact, nearly a dozen states (e.g., NY, FL, MD) and a growing share of municipalities (e.g., Berkeley, Detroit, Sacramento) have amended their constitutions or charters to implement gender-neutral language, indicating the sustained political salience of gendered language among state and local citizenries. Indeed, several states and localities are slated to vote on gender-neutral amendments in the November 2020 General Election (e.g. UT, MN and Washington DC). Importantly, these amendments afford the opportunity to analyze the sources of voter support for codifying gender equality in language, and to do so with an eye toward testing theories of female empowerment.

**POPULAR SUPPORT FOR GENDER-NEUTRAL LANGUAGE INITIATIVES**

In seeking to explain female political behavior and empowerment, recent literature in the United States tends to prioritize explanations based on gendered early-childhood socialization (e.g. Fox and Lawless 2004) and resultant psychological barriers like conflict avoidance (Kanthak and Woon 2015; Schneider et al. 2016). In this letter, we concentrate on a longstanding theoretical framework for female empowerment that focuses on women's acquisition of economic resources (Burns et al. 1997; Paxton et al. 2007; Schlozman, et al. 1994). Command over economic resources serves as a source of social power (Earle 1997), and in societal contexts where gender roles historically reduced women's resources by assigning them to domestic roles,

increases in women's command over economic resources (e.g., income) is theorized to translate into greater household power and to spill over into political life (Burns et al. 1997; Iversen and Rosenbluth 2006) [1]. One indicator of female empowerment is the earnings of women relative to men, as research on "family power" indicates that women's authority within their household expands as their earnings match or surpass those of men (McDonald 1980; Blumberg and Coleman 1989). According to this framework, as more women in an area acquire economic resources matching those of men, we should observe an empowerment effect manifest in the political arena in the form of augmented demand for gender equality. Applied to the case of language-politics, the primary expectation is that support for gender-neutral language propositions should be higher in contexts where women's incomes are closer to parity with men.

We test this expectation on the oldest case where amending a state constitution to implement gender-neutral language was put to a popular vote: Proposition 11 in California in 1974. We then perform a replication test using Question 2 in New Hampshire in 1998. For our analysis of support for gender-neutral language amendments in CA and NH we rely upon city-level historical administrative election results data. Finally, to increase the precision of our analysis, we perform two additional replication tests using fine-grained precinct-level election results data from gender-neutral amendments to municipal charters in Lincoln, Nebraska and Philadelphia, Pennsylvania, subjected to popular vote in 2019.

## AMENDING CALIFORNIA'S STATE CONSTITUTION IN 1974

[1]While this theoretical framework positions changes in economic resources as causally prior to changes in political behavior and norms, existing research suggests that the reverse may occur, where entrenched societal norms (e.g., matrilineality) are causally prior to women's economic resources, autonomy, and political participation (e.g., Brulé and Gaikwad 2018; Lowes 2020). A review of anthropological literature suggests there is likely a complex endogenous relationship between material conditions and cultural norms, as available material resources within a geographic area might shape evolved subsistence strategies and accompanying cultural norms (patrilineal vs. matrilineal decent systems) (e.g., Mattison 2011). In the end, theoretical or empirical adjudication of which factor is causally prior is beyond the scope of this letter; instead, we begin causally "downstream" with the empirically-supported expectation that an increase in women's economic resources will lead to political empowerment.

Proposition 11, known as the "Miscellaneous Language Changes Regarding Gender Act," was a constitutional amendment that sought to change constitutional language in CA to "draw no distinction between men and women" (Voter Information Guide 1974). Prop 11 would alter the constitution to eliminate any instances of gender language ("he" or "Assemblyman") and replace it with gender-neutral verbiage ("the person" or "member of the Assembly"). This proposition appeared on the state ballot in the 1974 General Election and narrowly passed into law after receiving a "Yes" vote by 51.1% of the state electorate.

The controversy surrounding this measure highlights the gender politics of the 1970s. The "pro" argument in favor of making this change was to accurately reflect the state of politics and everyday life. For instance, "[b]oth men and women work in our society. However, the Constitution specifies a system of 'work*men's* compensation.' The Constitutional amendment substitutes a more accurate characterization…" Another argued benefit was the reflection of women's ability to run and win statewide political offices and to recognize equal opportunity in political participation. The "con" argument against Prop 11 was that there is nothing that necessitates the alteration of English colloquialisms to reflect the progression of civil rights and that it would be "absurd" to pander to those who believed masculine language discriminated against women (Weinland 1974). Prop 11 provides an ideal case for investigating the politics of language as it concerns gender. Historically, Prop 11 appeared at the height of "second-wave" feminism and the Women's Movement in the U.S. (Bergeron 2015) and is the first case of holding a popular vote to amend a government constitution to implement gender-neutral language. As such, Prop 11 provides a previously unexplored test case for the operation of female empowerment in shaping voter support for a policy that would codify gender equality in language into state law.

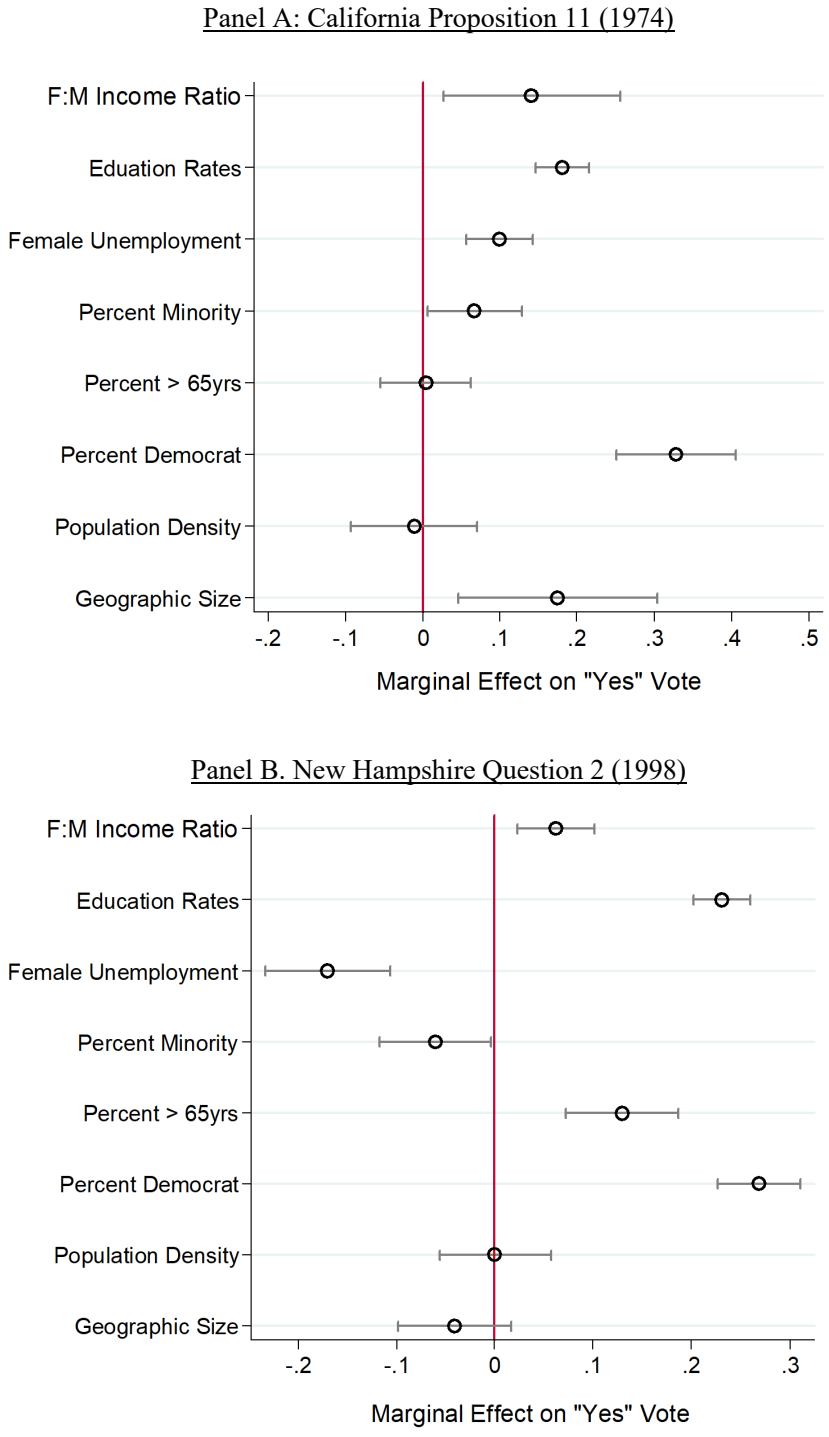
We obtained city-level election results for the 1974 election through special request from the CA State Archive held in the Office of the California Secretary of State. For each CA city in 1974, this data included tallies of the vote for Prop 11, which enabled us to create the percent of voters in each city voting "Yes," which serves as the dependent variable of our analysis. We combined the city-level administrative election data with demographic data from the 1970 Decennial Census[2], yielding complete election and Census data for N=324 cities. Our independent variable of theoretical interest is the *F:M Income Ratio*, which is the ratio of the average income of females to males in each CA city (mean=.303, sd=.099, min=.08, max=1.66). Increasing values on this variable indicate going from cities where women's earnings on average lag behind those of men to cities where they have surpassed those of men[3]. To ensure that the estimated effect of the income ratio is not capturing potentially correlated variables that influenced support for Prop 11, our analysis includes city-level controls for population density, geographic size, education rates, female unemployment, and the size of the nonwhite and elderly (>65 years) population. Additionally, to ensure that the income ratio is not capturing variation across cities in political leanings, our analysis controls for the percent of city voters registered Democrat in 1974. For more information about variable measurement, see Appendix A.

Our analytic strategy involves the use of multivariate regression. Given our use of observational data, we are limited in making strong causal claims about the effect of income ratios on voting behavior. However, our analysis includes controls for a variety of conceivable confounders (e.g., partisanship), and we present results from placebo tests that further dispel the

[2]The 1970 Decennial Census data was drawn from Social Explorer (https://www.socialexplorer.com/), which only provides data at the state, county, and tract levels. To obtain city-level estimates of demographic variables, we converted tract-level data to city using a weighted spatial join (see Appendix A).

[3] Examples of CA cities scoring high (i.e., above 90$^{th}$ percentile) on this ratio in 1970 are Sacramento, Alhambra, Hermosa Beach, Inglewood, Brisbane, and Emeryville. These cities in 1970 tended to have more residents over 65, fewer college graduates, more non-Whites, more registered Democrats, and lower female unemployment. Table C1 provides the correlations between the *F:M Income Ratio* and model controls.

**Figure 1. The Effect of City Female-To-Male Income Ratio on Voter Support for Gender-Neutral Amendment to State Constitutions**



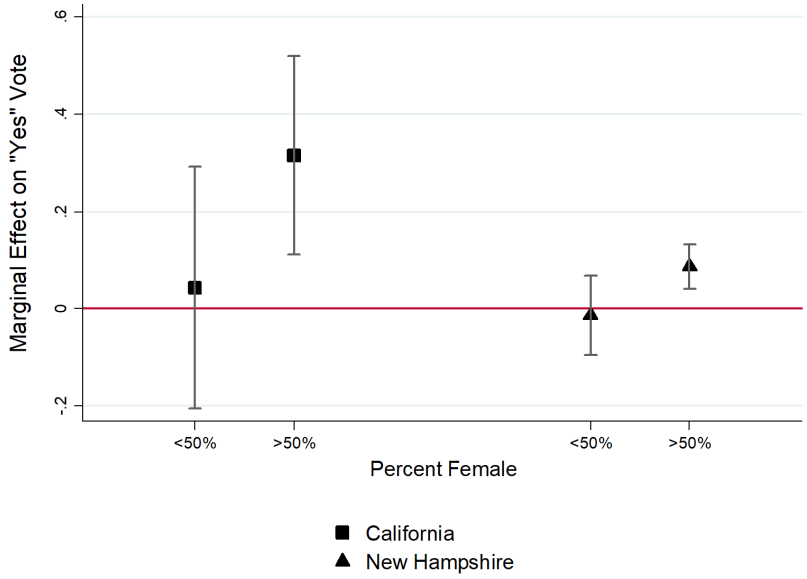

*Note*: Plots display unstandardized coefficient estimates from OLS regression models with 90% confidence intervals. *F:M Income Ratio* in each plot is the ratio of average income of females to males in each city. Full regression results in Table C2 and C9.

concern that the income ratio is capturing an omitted variable. For ease of interpretation, we present in Figure 1 panel A results from a linear regression model where all independent variables have been recoded to range from 0 to 1. Full model results are available in Table C2. The results in panel A reveal that moving from cities where women's incomes on average lag far behind those of men to cities where their incomes on average surpass those of men is associated with a statistically significant increase in aggregate support for Prop 11. In addition to being statistically significant, the effect of *F:M Income Ratio* is substantively meaningful, as it involves a 14-percentage point increase in support.

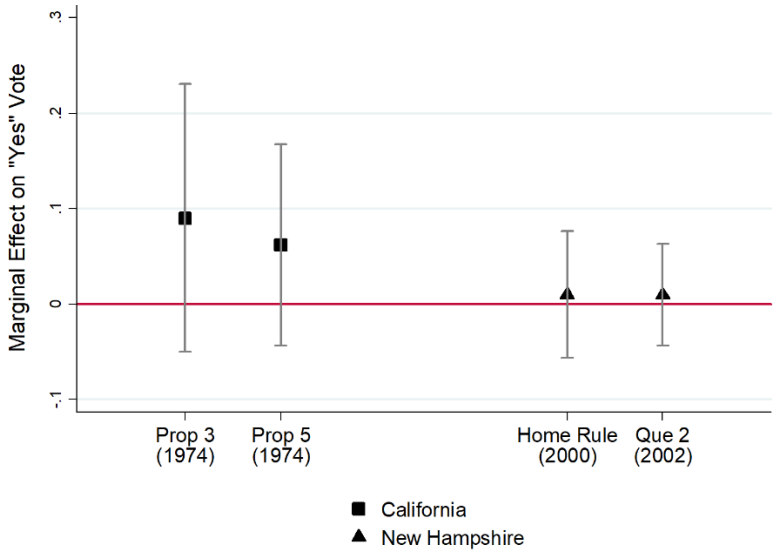
Importantly, our results hold when using robust standard errors (Table C3), beta regression (Table C4), controlling for absolute differences across cities in income (Table C5), and when missing data—due to absent census tract data—is imputed using county-level census data (Table C6). Additionally, when excluding the city of Yountville, which is a notable outlier with a value of 1.66 for the *F:M Income Ratio*, the estimated effect of the ratio is even larger ($\beta$=.27, se=.11, p<.05) (Table C7). Our use of aggregate data prevents us from inferring whether our main findings are driven by female voters, and ecological inference methods are inapplicable due to the lack of needed variation in the gender composition of cities. One available method is to conduct subsample analyses by the size of a city's female population; Figure 2 panel A reveals that the *F:M Income Ratio* only exerts significant effects in cities housing a greater share of women, suggesting that the results are likely driven by female voters. Finally, as a placebo test, we analyze the effect of the income ratio on gender-irrelevant ballot measures in the 1974 election—Proposition 3 involving a civil service exemption for specific government employees and Proposition 5 involving residency requirements for local government employees. As can be

**Figure 2. Mechanism and Placebo Tests on Main Results in CA and NH**

Panel A. Mechanism Tests—Results by Female Population Size




Panel B. Placebo Tests—Gender-Irrelevant Ballot Measures




*Note*: Plots displays unstandardized coefficient estimates for *F:M Income Ratio* on predicted "Yes" vote for each ballot measure from OLS regression models with 90% confidence intervals. Panel A presents the estimated effects of *F:M Income Ratio* on the predicted "Yes" vote for gender-neutral ballot measures in CA and NH using subsamples where *Percent Female* in a city is set to be either below or above 50% of the total city population. Panel B presents the estimated effects of *F:M Income Ratio* on the predicted "Yes" vote for gender-irrelevant ballot measures in CA (Propositions 3 and 5 in 1974) and NH (Home Rule in 2000 and Question 2 in 2002). Full regression results in Tables C2 and C9.

seen in Figure 2 panel B, there is no systematic relationship between *F:M Income Ratio* and support for these gender-irrelevant measures.

**REPLICATION: NEW HAMPSHIRE IN 1998**

To ensure that our results are not unique to CA, we offer a replication test using Question 2 in New Hampshire (NH) appearing in the 1998 General Election. Question 2 presented voters with the option to amend the state constitution to "make it more inclusive by changing specific references to the governor and other people to gender-neutral terms." While varying slightly in language and length, the substance of Question 2 is nearly identical to CA's Prop 11 (full language for ballot propositions is available in Appendix B). In contrast to Prop 11, however, Question 2 failed to pass: the "Yes" vote was 56.7 percent, placing it a few percentage points below the two-thirds threshold required for voters to pass constitutional amendments in NH.

Administrative election results at the city-level for the 1998 election in NH is publicly available at the Secretary of State's Election Division website[4]. The dependent variable in this analysis is city-level percent "Yes" vote on Question 2, and we use the same model and controls used for the CA analysis[5]. We present the results from this analysis in Figure 1 panel B (Table C9). As can be seen, nearly two decades after Proposition 11 in CA and on the opposite side of the continent, we find that an increase in *F:M Income Ratio* is associated with a significant increase in support for amending the state constitution to contain gender-neutral language. As was done with Prop 11, we demonstrate in Figure 2 that the *F:M Income Ratio* across cities in NH (1) only exerts significant effects in cities with a larger female population (panel A) and (2)

[4] http://sos.nh.gov/Elections.aspx

[5] We utilize demographic data from the 2000 Decennial Census drawn from Social Explorer, which provides data for median income by sex for the 1999 tax year. The *F:M Income Ratio* for this analysis is the ratio of the median income of females to males in each NH city. The 1990 census data housed in Social Explorer does not provide a tabulation of average or median income by sex.

fails to impact gender-irrelevant state ballot measures—a constitutional amendment to provide NH municipalities with home rule authority (November 2000 General Election) and a measure (Question 2) concerning holding a statewide constitutional convention (November 2002 General Election) (panel B).

**REPLICATION: AMENDING MUNCIPAL CHARTERS**

Our analyses of gender-neutral language amendments in CA and NH rely on data collected for relatively large units of geographic aggregation (i.e., city). We attempt to hone-in on the mechanism driving our results by demonstrating that the *F:M Income Ratio* only exerts significant effects in cities with more women, which suggests that our results are driven by female voters who are economically empowered relative to the men around them. However, it would be of value to demonstrate that our results hold when using additional cases offering finer-grained data, as this would potentially offer greater variation in the *F:M Income Ratio* and increase the generalizability of our findings by replicating results across different units of aggregation and political and temporal contexts.

To this effect, we perform additional replication tests using precinct-level election results data from two American cities (Lincoln, NE and Philadelphia, PA) that subjected to popular vote measures to amend their municipal charters to promote gender-neutral language. While both cases serve to illustrate the robustness of our state-level findings, the analysis in Lincoln stands to illustrate that our findings may extend beyond liberal coastal states to a city located in a very conservative midwestern American state. A principal benefit offered by our analysis in Philadelphia is the public availability of the Philadelphia county administrative voter file and its inclusion of data on voter sex, which enables us to gain precision on the role that female voters

play in generating our findings by estimating the effect of the *F:M Income Ratio* conditional on the number of female voters across election precincts.

***Charter Amendment 5 in Lincoln, Nebraska***

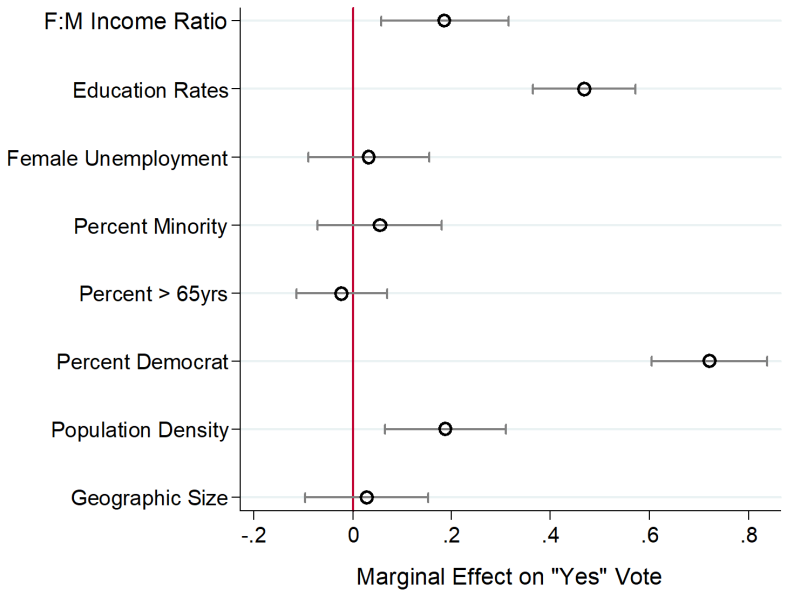
On May 7, 2019, the residents of the City of Lincoln, Nebraska in Lancaster County voted on 5 charter amendments, including one aimed at gendered language in the city charter. This ballot initiative added a new Article (XII) that clarifies that language in the city charter referring to "he" or "his" is intended to be interpreted as gender-neutral. The measure passed with over 70 percent support. The dependent variable in this analysis is precinct-level support, the percent "Yes" vote, in Lincoln's N=183 election precincts. We retrieved election results from the Lancaster County Election Commissioner's website. We use the same model and control variables used in previous analyses.[6] We present the results from this analysis in Figure 3 (Table C10). Consistent with previous cases, we find that an increase in the *F:M Income Ratio* is associated with a significant increase in precinct-level voter support for amending the city charter. As with previous cases, we find that the *F:M Income Ratio* (1) only exerts significant effects in cities with a larger female population, and (2) fails to impact other gender-irrelevant charter amendments voted on in the May 2019 election (Table C10).

***Question 1 in Philadelphia, Pennsylvania***

The city of Philadelphia presented voters with Question 1 on the ballot during the municipal Primary Election held on May 21st, 2019. Question 1, titled "Gender-Neutral References for City Council Charter Amendment", gave voters in the city the opportunity to vote

[6]To obtain precinct-level control variables, we performed a weighted spatial join to merge census data from tracts and block groups to the precinct. We use the 2013-2017 American Community Survey (ACS) five-year file, which provides tract-level data on the median earnings of males and females. The *F:M Income Ratio* in this analysis is the ratio of median earnings of females to males based on precinct estimates of median male and female earnings derived from our weighted spatial join. Full details in Appendix A.

**Figure 3. The Effect of Precinct Female-To-Male Income Ratio on Voter Support for Gender-Neutral Amendment to City Charter in Lincoln in 2019**



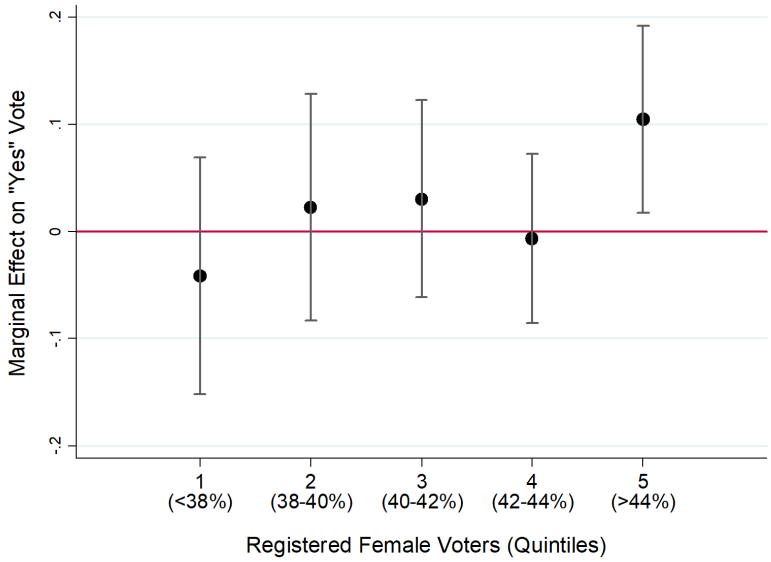

*Note*: Plots display unstandardized coefficient estimates from OLS regression models with 90% confidence intervals. All covariates have been recoded to range from 0-1. *F:M Income Ratio* is the estimated ratio of median earnings of females to males in each precinct. Full regression results in Table C10.

in favor of altering gendered references in the city charter (e.g., "councilman") to gender-neutral terms (e.g., councilmember). The measured passed, with a yes vote of 67.8 percent. We retrieved precinct-level[7] election results from the Office of the Philadelphia City Commissioners. Our analysis includes the percent "Yes" vote on Question 1 for N=1,692 precincts, which is reduced to N=1,527 once we include the set of controls used in the previous two analyses[8]. The average precinct in Philadelphia contained 621 registered voters in 2019, with an average of 143 turning out to vote in the May Primary. In addition to improving the precision of our unit of analysis from city to precinct, we were able to improve the precision of the moderating variable in the previous analyses (i.e., percent female) by using the Pennsylvania State Voter File to calculate

[7] The smallest political geographic unit in Philadelphia County is the ward-division, which is similar to what other cities and counties call electoral precincts.
[8] We use the same data and procedure as outlined in footnote 6.

the percent female of registered voters in each precinct in Philadelphia County[9]. This enables us to estimate the effect of the *F:M Income Ratio* conditional on the density of female voters.

**Figure 4. The Effect of Precinct Female-To-Male Income Ratio on Voter Support for Gender-Neutral Amendment to City Charter (Question 1) in Philadelphia in 2019**




*Note*: Plots displays unstandardized coefficient estimates for *F:M Income Ratio* on predicted "Yes" vote for each ballot measure from OLS regression models with 90% confidence intervals. Full regression results in Table C11.

As our primary interest is increasing the precision of our analysis by honing-in on female voters, we present the results from an analysis of the effect of precinct-level *F:M Income Ratio* by quintiles of the percent of registered voters that are female within precincts. The results are presented in Figure 4 (Table C11), which reveals that only in precincts with a higher density of female voters do we observe a positive and statistically significant effect of the income ratio. These results are a critical addition to our previous findings: by using a drastically smaller unit of geographic aggregation and a moderator focusing specifically on density of female *voters*, we are

[9] We retrieved the Pennsylvania Voter File on June 10th, 2019, which ensures that our voter data are indexed in time to the May 2019 precinct-level election results data. See Appendix A for more information.

more precisely able to infer that our results are driven by female voters who are economically empowered relative to the men *immediately* surrounding them (i.e., in their neighborhood of residence). Finally, as was done in our previous analyses, we demonstrate that our findings are confined to Question 1 and do not manifest when analyzing a measure on the ballot having nothing to do with gender politics—in this case, Question 4, which proposed creating a new class of unarmed police officer in the city tasked with regulating traffic and enforcing code violations. Support for this measure is entirely unrelated to precinct differences in the ratio of female to male earnings across all quintiles of percent female voters (Table C12).

**CONCLUSION**

It may be tempting to view debate over gendered language as trivial. Existing research, however, demonstrates that the use of gendered language can have deleterious effects for women (Stahlberg, et al. 2007; Prewitt-Freilino et al. 2012; Jakiela and Ozer 2018). In response, global organizations, like the World Bank, are moving to use gender-inclusive language to avoid limiting the opportunities for women globally (The World Bank 2019). In the United States, efforts to implement gender-neutral language remain politically salient, with states and localities continuing to adopt amendments to remove gendered language from their constitutions and official documents (The Associated Press 2003).

This letter explores historic and recent examples of such amendments and reveals that voter support for implementing gender-neutral language is systematically associated with women's economic resources relative to men. Specifically, our findings suggest that the economic empowerment of women is an important factor behind the success of these amendments. One limitation of our study is its reliance on aggregate election results data, which limits our ability to draw firm inferences about the behavior of individual (female) voters. This

said, we offer ancillary analyses demonstrating that our findings are confined to contexts where women comprise a larger share of the population, or a larger share of registered voters (i.e., Philadelphia analysis), which suggests our findings are driven by female voters. Moreover, we demonstrate that our city-level results in CA and NH hold when analyzing recent municipal ballot measures and using the finest-grained elections results data available (i.e., precinct). The findings across our four cases increases our confidence that our results are generalizable across level of aggregation (city vs. precinct), level of government (state vs. municipal ballot measure), political context (liberal coastal vs. conservative Midwestern state), and time (1974-2019).

We see several directions for future research. For example, future research could investigate popular support for gender-neutral language amendments in other states and localities (e.g., New York in 2001), the effect of language changes on other marginalized groups (e.g., changing "Latino" to "Latinx"), and crucially, how passage of such amendments shape norms and mass attitudes. On this latter issue, one clear follow-up to our research would be an investigation of whether or not adoption of gender-neutral language in official state documents exerts an impact on mass discourse, gender relations, or public attitudes concerning gender. Existing research suggests it might. Tankard and Paluck (2017), for example, show that the Supreme Court ruling on gay marriage, an institutional endorsement codified in legal documents, can shape social norms and mass attitudes toward gay marriage and gay people. Other work has shown similar effects of Supreme Court actions on affirmative action and flag burning (Bartels and Mutz 2009; Clawson et al. 2001). Further, a vote that results in the successful passage of a ballot proposition is not just a sign of institutional endorsement but of mass public opinion and shared social norms, which can themselves change attitudes, a process that Mutz (1998) calls "impersonal influence" (see also Paluck and Chwe 2017). Thus, it is possible that governmental

implementation of gender-neutral language in symbolically important founding documents could have similar effects, though we leave exploration of this possibility to future research.

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**SUPPLEMENTAL APPENDIX A**
**Data and Variable Measurement**

## I. California 1974 Data

A. Historic Election Data
The data was obtained through a formal request to the California Secretary of State's Office (https://www.sos.ca.gov/elections/). We completed a Copy Order Form and obtained the data on 10/22/2018. Control variables for Party Registration were obtained through the 1974 Report of Registration also prepared by the California Secretary of State.

B. Census Data
We pulled census tract data from the 1970 Decennial Census from the U.S. Census Bureau via Social Explorer (https://www.socialexplorer.com/). We joined the tract level data to California city geographies using a weighted spatial join which aggregated data up from the tract level to the place level. Polygons for cities and tracts were obtained from the IPUMS historic GIS map database.

*F:M Income Ratio*
The quotient obtained from dividing the average income for females from the average income for males.
*Education Rates*
The percent of the population aged 25 years old or older that have a college degree or higher.
*Female Unemployment*
The percent of the female population 16 years of age or older that are in the labor force that are unemployed.
*Percent Minority*
The percent of the total population whose race on the 1970 Census form is designated as "Black" or "Some other race" (than White).
*Percent >65yrs*
The percent of the total population that is over 65 years of age.
*Percent Democrat*
The percent of registered voters that are Democrats in 1974.
*Population Density*
Population density per square mile.
*Area*
Total area, including land and water.

## II. New Hampshire 1998 Data

A. Historic Election Data
The data for Question 2, controls for partisanship, and both placebo tests were obtained through the New Hampshire Secretary of State's Office website (http://sos.nh.gov/ElectResults.aspx). We obtained the data via direct download on 01/16/2019.

B. Census Data
We pulled census tract data from the 2000 Decennial Census from the U.S. Census Bureau via Social Explorer (https://www.socialexplorer.com/). This data was drawn at the County Subdivision level, which corresponds to New Hampshire towns and cities and was matched by city/town name to the administrative election data

*F:M Income Ratio*
The quotient obtained from dividing the median income for females from the average income for males.
*Education Rates*
The percent of the population aged 25 years old or older that have a college degree or higher.
*Female Unemployment*
The percent of the female population 16 years of age or older that are in the labor force that are unemployed.
*Percent Minority*
The percent of the total population whose race on the 2000 Census form was not designated as "Non-Hispanic – White."
*Percent >65yrs*
The percent of the total population that is over 65 years of age.
*Percent Democrat*
Percent of votes cast for Republican candidate in 1996 Presidential Election.
*Population Density*
Population density per square mile.
*Area*
Total area, including land and water.

**III. Lincoln, NE 2019 Data**

A. Historic Election Data
The data for Lincoln, Nebraska election results of was obtained through the Lancaster County Election Commissioner's website. The data was downloaded directly from this website (https://www.lancaster.ne.gov/329/Election-Results) in February 2020.

B. Census Data
We pulled census block group and tract data from the 2013-2017 American Community Survey via Social Explorer (https://www.socialexplorer.com/) and American Fact Finder. Shape files for these administrative units were downloaded from the IPUMS NHGIS (National Historic Geographic Information System https://www.nhgis.org/). The shapefile for the latest Lincoln, Nebraska precincts was downloaded from Lancaster County Election Commissioner's website.

C. Weighted Spatial Join
Census block groups were aggregated to the precinct level using a weighted spatial join in R using the sf package's st_interpolation_aw() function. This function produces areal-weighted interpolations of polygon data from each shapefile based on the assumption that polygon attributes (like population) is evenly spatially distributed across the polygon.

D. Registered Voters
Data on Lancaster County's registered voters was also gathered from the Lancaster County Election Commissioner's website

*F:M Income Ratio*
The quotient obtained from dividing the median earnings for females from the median earnings for males.
*Education Rates*
The percent of the population aged 25 years old or older that have a college degree or higher.
*Female Unemployment*
The percent of the female population 16 years of age or older that are in the labor force that are unemployed
*Percent Minority*
The percent of the total population whose race on the 2013-2017 American Community Survey form that was not designated as "Non-Hispanic – White."
*Percent >65yrs*
The percent of the total population that is over 65 years of age.
*Percent Democrat*
Percent of registered voters that are Democrats in 2019.
*Population Density*
Population density per square mile.
*Area*
Total area, including land and water.

**IV. Philadelphia 2019 Data**

A. Historic Election Data
The data for Philadelphia election results of Question was obtained through The Office of the Philadelphia City Commissioners. The data was downloaded directly from this website (http://getphillyelectionresults.com/) on 07/01/2019.

B. Census Data
We pulled census tract and census block group data from the 2013-2017 American Community Survey via Social Explorer (https://www.socialexplorer.com/). Shape files for these administrative units were downloaded from the IPUMS NHGIS (National Historic Geographic Information System https://www.nhgis.org/). The shapefile for the latest Philadelphia precincts (ward-districts) was downloaded from the Office of the Philadelphia City Commissioner (https://www.philadelphiavotes.com/en/resources-a-data/political-maps) .

C. Weighted Spatial Join
Census block group and tract variables were aggregated to the precinct level using a weighted spatial join in R using the sf package's st_interpolation_aw() function. This function produces areal-weighted interpolations of polygon data from each shapefile based on the assumption that polygon attributes (like population) is evenly spatially distributed across the polygon.

D. Registered Voters

Data on Philadelphia County registered voters comes from the June 10, 2019 voter file downloaded from the Pennsylvania Department of State (https://www.pavoterservices.pa.gov/Pages/PurchasePAFULLVoterExport.aspx).

*F:M Income Ratio*

The quotient obtained from dividing the median earnings for females from the median earnings for males.

*Education Rates*

The percent of the population aged 25 years old or older that have a college degree or higher.

*Female Unemployment*

The percent of the female population 16 years of age or older that are in the labor force that are unemployed.

*Percent Minority*

The percent of the total population whose race in the 2013-2017 American Community Survey was not designated as "Non-Hispanic – White."

*Percent >65yrs*

The percent of the total population that is over 65 years of age.

*Percent Democrat*

Percent of registered voters in each electoral precinct registered as Democrats in the 2019 voter file.

*Population Density*

Population density per square mile.

*Area*

Total area, including land and water.

## SUPPLEMENTAL APPENDIX B
## Language of Ballot Propositions

**California Proposition 11 (1974):**

**Ballot Title:**
Miscellaneous Language Changes Regarding Gender. Legislative Constitutional Amendment. Amends Constitution to recast various terms presently couched in the masculine gender to refer to the "person" or official referred to and makes other minor, and nonsubstantive language changes. Financial impact: none.

**Proposal or Question provided:**
When the present State Constitution uses masculine words like "he" or "his," the words apply both to men and women. This constitutional amendment takes these masculine words out of the Constitution and replaces them with words which draw no distinction between men and women.

For example, the term "workmen's compensation" is changed to "workers' compensation'. "Congressman" is changed to "representative in Congress". "Assemblymen" is changed to "members of the Assembly". "Chairman" is changed to "presiding officer". Instead of referring to the Governor as "he," the amendment repeats the word "Governor".

**New Hampshire Question 2 (1998):**

**Ballot Title:**
Constitutional Amendments- Question 2

**Proposal or Question provided:**
Are you in favor of amending the constitution to make it more inclusive by changing specific references to the governor and other people to gender neutral terms?

**Lincoln, Nebraska Charter Amendment (2019):**

**Ballot Title:**
Gender Neutral Charter Amendment - Adding a new Article XII to clarify that the language of the Charter is to be gender neutral and interpreted as such.

**Proposal or Question provided:**
Shall a new Article XII be added to the Charter of the City of Lincoln to clarify that the language of the City Charter is intended to be gender neutral and should be interpreted as such? Vote FOR or AGAINST.

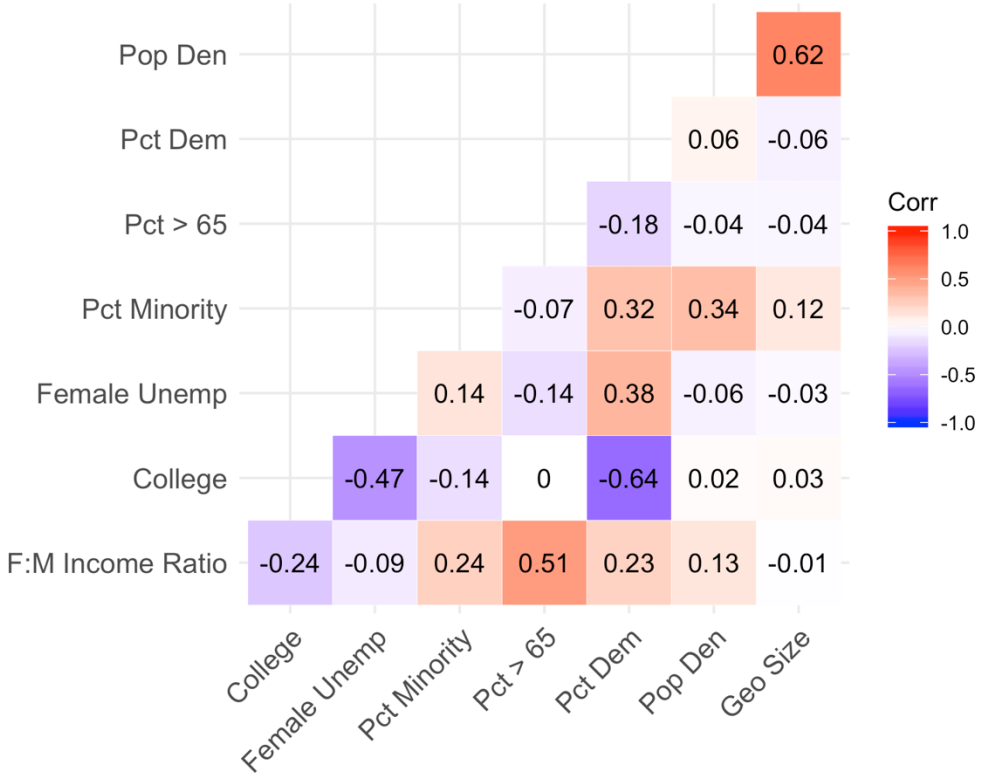
**Philadelphia Question 1 (2019):**

**Ballot Title:**
Proposing an amendment to The Philadelphia Home Rule Charter to change certain gender specific references (such as "councilman," "councilmen," and "Councilmanic") to gender neutral references (such as "councilmember," "councilmembers," and "Council"); and providing for the submission of the proposed amendment to the electors of Philadelphia.

**Proposal or Question provided:**
Shall The Philadelphia Home Rule Charter be amended to change certain gender specific references (such as "councilman," "councilmen," and "Councilmanic") to gender neutral references (such as "councilmember," "councilmembers," and "Council")?

**SUPPLEMENTAL APPENDIX C**
**Additional Analyses**

**Figure C1. Correlations between Model Variables**




*Note:* Correlation coefficients between independent variables and model controls in California dataset.

**Table C2. CA Prop 11 – Main Results, Results by Percent Female and Placebo Tests**

| | (1) CA Prop 11 | (2) CA Pct Fem < 50 | (3) CA Pct Fem > 50 | (4) CA Prop 3 | (5) CA Prop 5 |
|---|---|---|---|---|---|
| F:M Income Ratio | 0.141** | 0.0441 | 0.316** | 0.0902 | 0.0620 |
| | (0.0699) | (0.149) | (0.123) | (0.0852) | (0.0641) |
| Education Rates | 0.181*** | 0.169*** | 0.197*** | 0.306*** | 0.0176 |
| | (0.0210) | (0.0469) | (0.0240) | (0.0256) | (0.0192) |
| Female Unemployment | 0.0999*** | 0.0507 | 0.106*** | 0.130*** | -0.120*** |
| | (0.0263) | (0.0528) | (0.0306) | (0.0320) | (0.0241) |
| Percent Minority | 0.0675* | 0.117 | 0.0196 | 0.0545 | 0.00358 |
| | (0.0373) | (0.0728) | (0.0440) | (0.0455) | (0.0342) |
| Percent > 65yrs | 0.00416 | 0.00477 | 0.0108 | 0.103** | -0.131*** |
| | (0.0359) | (0.129) | (0.0382) | (0.0437) | (0.0329) |
| Percent Democrat | 0.328*** | 0.451*** | 0.299*** | 0.160*** | -0.142*** |
| | (0.0469) | (0.140) | (0.0501) | (0.0571) | (0.0430) |
| Population Density | -0.0695 | 0.418 | -0.0469 | -0.698* | -0.100 |
| | (0.315) | (0.736) | (0.356) | (0.384) | (0.289) |
| Geographic Size | 0.175** | -0.000186 | 0.379*** | 0.179* | 0.0787 |
| | (0.0785) | (0.138) | (0.117) | (0.0956) | (0.0720) |
| Constant | 0.239*** | 0.238*** | 0.212*** | 0.200*** | 0.700*** |
| | (0.0261) | (0.0704) | (0.0303) | (0.0318) | (0.0239) |
| Observations | 324 | 66 | 258 | 324 | 324 |
| R-squared | 0.278 | 0.292 | 0.300 | 0.359 | 0.240 |

Note: OLS regression coefficients. Standard errors in parentheses. Presents results from main model, models by presence of females, and placebo tests on gender-irrelevant outcomes.
*** p<0.01, ** p<0.05, * p<0.1

**TABLE C3. CA Prop 11 – Using Robust Standard Errors**

| | (1)<br>Prop 11 |
|---|---|
| F:M Income Ratio | 0.141** |
| | (0.066) |
| Education Rates | 0.181*** |
| | (0.033) |
| Female Unemployment | 0.099*** |
| | (0.030) |
| Percent Minority | 0.067 |
| | (0.046) |
| Percent > 65yrs | 0.004 |
| | (0.032) |
| Percent Democrat | 0.328*** |
| | (0.101) |
| Population Density | -0.069 |
| | (0.281) |
| Geographic Size | 0.175** |
| | (0.072) |
| Constant | 0.239*** |
| | (0.048) |
| Observations | 324 |
| R-squared | 0.278 |

Note: OLS regression coefficients. Robust standard errors in parentheses. This model assesses the robustness of our main results using robust standard errors.
*** p<0.01, ** p<0.05, * p<0.1

**TABLE C4. CA Prop 11 – Using Beta Regression**

| | (1)<br>Prop 11 |
|---|---|
| F:M Income Ratio | 0.559** |
| | (0.278) |
| Education Rates | 0.754*** |
| | (0.087) |
| Female Unemployment | 0.398*** |
| | (0.104) |
| Percent Minority | 0.253* |
| | (0.152) |
| Percent > 65yrs | 0.029 |
| | (0.143) |
| Percent Democrat | 1.403*** |
| | (0.204) |
| Population Density | -0.266 |
| | (1.245) |
| Geographic Size | 0.710** |
| | (0.312) |
| Constant | -1.087*** |
| | (0.110) |
| Observations | 324 |

Note: Beta regression coefficients. Standard errors in parentheses. This model demonstrates the robustness of our main findings when using a method that accounts for our outcome being bound between 0 and 1.
*** p<0.01, ** p<0.05, * p<0.1

**TABLE C5. CA Prop 11 – Controlling For Average Income**

| | (1)<br>Prop 11 |
|---|---|
| F:M Income Ratio | 0.160** |
| | (0.072) |
| Average Income | 2.40e-07** |
| | (1.13e-07) |
| Education Rates | 0.164*** |
| | (0.022) |
| Pct Female Unemp | 0.094*** |
| | (0.027) |
| Pct Minority | 0.064* |
| | (0.038) |
| Percent > 65yrs | -0.0003 |
| | (0.036) |
| Percent Democrat | 0.328*** |
| | (0.048) |
| Population Density | -3.406** |
| | (1.409) |
| Geographic Size | 0.134 |
| | (0.113) |
| Constant | 0.244*** |
| | (0.027) |
| Observations | 315 |
| R-squared | 0.258 |

Note: OLS regression coefficients. Standard errors in parentheses. This model assesses the robustness of our main results when adding a control for between-city differences in average income levels.
*** p<0.01, ** p<0.05, * p<0.1

**TABLE C6. CA Prop 11 – Imputing MD Using County Level Data**

| | (1)<br>Prop 11 |
|---|---|
| F:M Income Ratio | 0.184** |
| | (0.075) |
| Education Rates | 0.182*** |
| | (0.023) |
| Pct Female Unemp | 0.0946** |
| | (0.045) |
| Pct Minority | 0.064* |
| | (0.037) |
| Percent > 65yrs | -0.008 |
| | (0.043) |
| Percent Democrat | 0.307*** |
| | (0.044) |
| Population Density | 0.019 |
| | (0.017) |
| Geographic Size | -0.039 |
| | (0.044) |
| Constant | 0.249*** |
| | (0.034) |
| Observations | 402 |
| R-squared | 0.236 |

Note: OLS regression coefficients. Errors clustered at the county in parentheses. This model demonstrates the robustness of our results when filling in missing tract-level data used to perform our weighted spatial join by using county data.
*** p<0.01, ** p<0.05, * p<0.1

**TABLE C7. CA Prop 11 – Excluding Outlier**

| | (1)<br>Prop 11 |
|---|---|
| F:M Income Ratio | 0.271** |
| | (0.108) |
| Education Rates | 0.185*** |
| | (0.021) |
| Pct Female Unemp | 0.103*** |
| | (0.026) |
| Pct Minority | 0.052 |
| | (0.039) |
| Percent > 65yrs | -0.002 |
| | (0.036) |
| Percent Democrat | 0.320*** |
| | (0.047) |
| Population Density | -0.143 |
| | (0.317) |
| Geographic Size | 0.186** |
| | (0.079) |
| Constant | 0.225*** |
| | (0.028) |
| Observations | 323 |
| R-squared | 0.284 |

Note: OLS regression coefficients. Standard errors in parentheses. This analysis demonstrates the robustness of our main findings when excluding an outlier (Yountville, CA) from the data.
*** p<0.01, ** p<0.05, * p<0.1

**TABLE C8. CA Prop 11 with Median Income Categories**

| | *(1)* |
|---|---|
| | Yes on Prop 11 |
| F:M Income Ratio (medians) | 0.136* |
| | (0.071) |
| Pct College (4yr) | 0.181*** |
| | (0.021) |
| Pct Fem Unemployed | 0.093*** |
| | (0.026) |
| Pct Non-White | 0.073** |
| | (0.037) |
| Pct Over 65 | 0.002 |
| | (0.037) |
| Pct Democrat | 0.333*** |
| | (0.047) |
| Population Density | -0.005 |
| | (0.313) |
| Land Area | 0.172** |
| | (0.078) |
| Constant | 0.248*** |
| | (0.026) |
| Observations | 324 |
| $R^2$ | 0.277 |

OLS regression coefficients. Standard errors in parentheses. This analysis shows robustness of results to using median income ratios.
Two-tailed test *p<0.1; **p<0.05; ***p<0.01

**TABLE C9. Analysis of New Hampshire Ballot Measures**

| | (1) NH Que 2 | (2) NH Pct Fem < 50 | (3) NH Pct Fem > 50 | (4) NH Placebo 00 | (5) NH Placebo 02 |
|---|---|---|---|---|---|
| F:M Income Ratio | 0.0624*** | -0.0138 | 0.0871*** | 0.0101 | 0.00976 |
| | (0.0238) | (0.0493) | (0.0276) | (0.0403) | (0.0324) |
| Education Rates | 0.231*** | 0.227*** | 0.221*** | 0.244*** | 0.207*** |
| | (0.0177) | (0.0361) | (0.0200) | (0.0301) | (0.0241) |
| Pct Female Unemp | -0.170*** | -0.185*** | -0.0901 | 0.159** | -0.195*** |
| | (0.0386) | (0.0575) | (0.0684) | (0.0652) | (0.0523) |
| Pct Minority | -0.0610* | -0.120 | -0.0408 | -0.0437 | -0.0641 |
| | (0.0345) | (0.0797) | (0.0376) | (0.0583) | (0.0469) |
| Pct > 65yrs | 0.129*** | 0.0143 | 0.134*** | 0.0993 | 0.277*** |
| | (0.0348) | (0.0973) | (0.0395) | (0.0629) | (0.0473) |
| Pct Vote Democrat | 0.269*** | 0.340*** | 0.218*** | 0.000868 | -0.149*** |
| | (0.0256) | (0.0513) | (0.0302) | (0.0446) | (0.0348) |
| Population Density | -3.71e-07 | -4.19e-05 | -5.99e-06 | 5.39e-05*** | 5.11e-05*** |
| | (1.07e-05) | (5.93e-05) | (1.13e-05) | (1.81e-05) | (1.46e-05) |
| Geographic Size | -0.0412 | -0.0411 | -0.0152 | 0.0490 | 0.119** |
| | (0.0352) | (0.0481) | (0.0562) | (0.0606) | (0.0478) |
| Constant | 0.312*** | 0.356*** | 0.317*** | 0.326*** | 0.416*** |
| | (0.0212) | (0.0415) | (0.0263) | (0.0361) | (0.0288) |
| Observations | 237 | 94 | 143 | 235 | 237 |
| R-squared | 0.635 | 0.690 | 0.589 | 0.286 | 0.449 |

Note: OLS regression coefficients. Standard errors in parentheses. Table presents main results, results by city female population, and results from placebo tests on irrelevant-outcomes.

*** p<0.01, ** p<0.05, * p<0.1

**TABLE C10. Analysis of Lincoln, Nebraska Ballot Measures**

| | *Dependent variable:* | | | | | | |
|---|---|---|---|---|---|---|---|
| | | Gender | | Bond | Draft | Coal | Auditorium |
| | Full | >Median | <Median | (4) | (5) | (6) | (7) |
| F:M Income Ratio | 0.186** | 0.258* | 0.128 | 0.026 | 0.027 | 0.004 | 0.044 |
| | (0.079) | (0.144) | (0.099) | (0.025) | (0.025) | (0.025) | (0.029) |
| Education Rates | 0.469*** | 0.525*** | 0.440*** | 0.216*** | 0.173*** | 0.146*** | 0.245*** |
| | (0.063) | (0.111) | (0.079) | (0.020) | (0.020) | (0.020) | (0.023) |
| Pct Female Unemp | 0.032 | 0.158 | -0.040 | 0.034 | 0.044* | 0.060** | 0.017 |
| | (0.074) | (0.131) | (0.092) | (0.024) | (0.024) | (0.023) | (0.027) |
| Pct Minority | 0.054 | -0.032 | 0.137 | 0.018 | 0.013 | -0.014 | 0.006 |
| | (0.077) | (0.137) | (0.097) | (0.024) | (0.024) | (0.024) | (0.028) |
| Percent > 65yrs | -0.023 | -0.050 | 0.028 | -0.010 | 0.004 | -0.016 | -0.039* |
| | (0.056) | (0.082) | (0.082) | (0.018) | (0.018) | (0.017) | (0.020) |
| Percent Democrat | 0.721*** | 0.674*** | 0.790*** | 0.009 | -0.041* | -0.040* | 0.081*** |
| | (0.071) | (0.112) | (0.097) | (0.023) | (0.023) | (0.022) | (0.026) |
| Population Density | 0.188** | 0.130 | 0.213** | 0.078*** | 0.048** | 0.007 | 0.051* |
| | (0.074) | (0.142) | (0.093) | (0.024) | (0.024) | (0.023) | (0.027) |
| Geographic Size | 0.028 | 0.040 | 0.024 | -0.016 | -0.001 | -0.048** | -0.045 |
| | (0.076) | (0.138) | (0.094) | (0.024) | (0.024) | (0.024) | (0.028) |
| Constant | -0.183*** | -0.187* | -0.215*** | 0.610*** | 0.665*** | 0.728*** | 0.459*** |
| | (0.062) | (0.105) | (0.079) | (0.020) | (0.020) | (0.019) | (0.023) |
| Observations | 183 | 91 | 92 | 183 | 183 | 183 | 183 |
| $R^2$ | 0.577 | 0.469 | 0.672 | 0.449 | 0.355 | 0.341 | 0.450 |

Note: OLS regression coefficients. Standard errors in parentheses. Results from main analysis, analysis by precinct female population, and results for placebo tests on gender-irrelevant outcomes.
*p<0.1; **p<0.05; ***p<0.01

**TABLE C11. Analysis of Gender-Neutral Amendment to City Charter in Philadelphia in 2019**

| | | Quintile of Percent Female of Registered Voters | | | | |
|---|---|---|---|---|---|---|
| | Full Model | 1st | 2nd | 3rd | 4th | 5th |
| F:M Income Ratio | .022 | -0.041 | 0.022 | 0.030 | -0.006 | 0.105** |
| | (.026) | (.067) | (.064) | (.055) | (.047) | (.052) |
| Education Rates | .510*** | 0.515*** | 0.533*** | 0.467*** | 0.528*** | 0.416*** |
| | (.020) | (.051) | (.051) | (.041) | (.040) | (.045) |
| Pct Female Unemp | .019 | 0.0544 | 0.066 | -0.076 | -0.015 | -0.047 |
| | (.025) | (.055) | (.063) | (.056) | (.051) | (.055) |
| Pct Minority | .038^ | 0.085* | 0.044 | -0.015 | 0.027 | -0.029 |
| | (.022) | (.051) | (.047) | (.044) | (.049) | (.055) |
| Pct > 65yrs | -.250 | -0.305*** | -0.221*** | -0.200*** | -0.168*** | -0.244*** |
| | (.020) | (.056) | (.057) | (.048) | (.041) | (.035) |
| Pct Vote Democrat | .328*** | 0.264*** | 0.384*** | 0.408*** | 0.327*** | 0.275*** |
| | (.027) | (.063) | (.058) | (.057) | (.062) | (.066) |
| Population Density | .237*** | 0.482*** | 0.457*** | 0.258* | 0.019 | 0.442*** |
| | (.054) | (.173) | (.138) | (.135) | (.075) | (.165) |
| Geographic Size | -.200*** | -0.663* | -0.316 | -0.447 | 0.129 | -0.013 |
| | (.141) | (.339) | (.342) | (.333) | (.241) | (.324) |
| Constant | .341 | 0.385*** | 0.253*** | 0.328*** | 0.335*** | 0.430*** |
| | (.015) | (.046) | (.039) | (.034) | (.032) | (.036) |
| Observations | 1,527 | 305 | 302 | 309 | 312 | 299 |
| R-squared | 0.557 | 0.559 | 0.612 | 0.603 | 0.607 | 0.439 |

Note: OLS regression coefficients. Standard errors in parentheses. Results for full sample of precincts and subsamples by quintile of percent female of registered voters.

*** p<0.01, ** p<0.05, * p<0.1

**TABLE C12. Analysis of Question 4 in Philadelphia in 2019**

| | Quintile of Percent Female of Registered Voters | | | | |
|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th |
| F:M Income Ratio | -.016 | .001 | .028 | .013 | .013 |
| | (.056) | (.052) | (.048) | (.044) | (.042) |
| Education Rates | .324*** | .307*** | .227*** | .291*** | .207*** |
| | (.043) | (.041) | (.036) | (.037) | (.037) |
| Pct Female Unemp | .105** | .055 | .023 | .118** | .028 |
| | (.047) | (.051) | (.049) | (.047) | (.044) |
| Pct Minority | .217*** | .182*** | .101*** | .131*** | .088** |
| | (.043) | (.038) | (.038) | (.045) | (.044) |
| Pct > 65yrs | -.276*** | -.215*** | -.058 | -.090** | -.117*** |
| | (.048) | (.047) | (.042) | (.038) | (.028) |
| Pct Vote Democrat | .182*** | .294*** | .297*** | .169*** | .261*** |
| | (.053) | (.047) | (.050) | (.057) | (.053) |
| Population Density | .225 | .094 | .217* | .157** | .216 |
| | (.146) | (.112) | (.118) | (.069) | (.134) |
| Geographic Size | .131 | .358 | -.355 | -.065 | -.233 |
| | (.287) | (.279) | (.291) | (.222) | (.262) |
| Constant | .412*** | .345*** | .361*** | .408*** | .429*** |
| | (.039) | (.032) | (.030) | (.029) | (.029) |
| Observations | 305 | 302 | 309 | 312 | 299 |
| R-squared | 0.617 | 0.639 | 0.533 | 0.383 | 0.401 |

OLS regression coefficients. Standard errors in parentheses. Results from placebo test on a gender-irrelevant outcome.

*** p<0.01, ** p<0.05, * p<0.1