Does Gender Matter for Political Leadership?
The Case of U.S. Mayors*

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Abstract

Women’s participation in local mayoral elections increased from negligible numbers in 1970 to about one-third of the elections in the 2000’s. We estimate the short and long run impacts of electing a female mayor on local policy and political outcomes using a regression discontinuity design that compares outcomes in cities where a female barely won versus outcomes in cities where a female barely lost a mayoral election. In contrast to most research on the influence of female leadership in politics, we find no effect of gender on policy outcomes related to the size of local government, the composition of municipal spending and employment, or crime rates. This suggests that the context in which political power is exercised matters. Tiebout sorting and local political competition within a metropolitan area provide strong incentives for local leaders to implement policies that satisfy their median voter, even if that conflicts with their own preferences. While female mayors do not implement different policies, they do appear to have higher unobserved political skills, as they are more likely to win reelection than a comparable male. This is consistent with an environment in which they face bias in the electorate, and are able to surmount it by being a better politician than their male counterparts. Finally, we find no evidence that women who achieve leadership positions in local politics serve as role models that lead other women to run for office. Exogenously electing a female mayor does not change the long run political participation of female mayoral candidates in the city. There also is no effect on female participation in local congressional elections.

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I. Introduction

Even with the recent increase in women taking on leadership roles in both the public and private sectors of many countries, females remain underrepresented in many important economic and political positions.¹ This fact has attracted much research by economists and other social scientists. One strand of inquiry by economists has focused on the roles of discrimination and gender differences in accounting for why this outcome exists (e.g., Black 2004; Beaman et. al. 2008). Another line of work has focused on the implications of female leadership (or the lack thereof, as the case may be) in public policy outcomes (e.g., Chattopadhyay and Duflo (2004), Clots-Figueras (2008), Funk and Gathmann (2008), Gagliarducci and Paserman (2009)).²

The analysis in this paper is closely related to this second strand of research. We first document and then estimate the impact of female participation in the executive branch of U.S. cities from 1950 to 2005. The underlying data source is an updated version of the mayoral election series used in Ferreira and Gyourko’s (2009) study of local political partisanship. Information on nearly 5,000 direct mayoral elections between 1950 and 2005 in approximately 500 cities with populations of at least 25,000 residents as of the year 2000 is used in the empirical analysis.

Our study differs from existing research in several ways. For example, it is the first to focus on women in chief executive positions in the local public sector, not on legislative participation.³ Our long-term mayoral election data provides us with significantly more observations than currently available data on female executives in the private sector because participation by women in the public sector is much greater.⁴ Our data set also allows us to study the impact of female leadership

¹ For example, female representation in national parliaments increased from an average of 1%-2% in 1970 to nearly 15% in 2000 (Worldwide Statistical Survey (1995), but obviously remains well short of their share of the population. In the executive branch of national governments, women have reached the pinnacle in Argentina, Germany, India, and United Kingdom, among others. And, the U.S. saw its most competitive female candidate ever in Hilary Clinton in the most recent Presidential primary campaign. On the private side, Wolfer’s (2006) tracks the increase in women CEOs among publicly-traded European companies, but still finds that only 1.3% of CEO-years were worked by females over his 15-year sample period. Some very high profile U.S. companies are (EBay) or were (Hewlitt-Packard) headed by women, but their share of all CEO jobs remains quite low.
² A separate branch of this literature investigates the impact of women’s suffrage rights and the increase in their labor market participation on fiscal outcomes. See Miller (2008), Lott and Kenny (1999) and Cavalcanti and Tavares (2006) for recent examples.
³ Rehavi (2008) examines the impact of female state legislators in the U.S., and reports that increases in women legislators are associated with increases in health-related spending and decreases in corrections expenditures.
⁴ Research on the impact of women CEOs in the private sector generally does not find significant effects on stock prices or other measures of productivity, but very small sample sizes makes those results hard to interpret, given the lack of power. See Wolfer (2006) for more on that literature.
over time, including long run outcomes such as role model effect that a winning female mayor might have on participation by other women in future elections. By studying female political leaders in a more economically developed country such as the United States, we are able to add to a literature that includes important work on the influence of women political leadership in countries such as India, much of which finds a very strong impact of gender (e.g., Chattopadhyay and Duflo (2004) and Clots-Figueras (2009)). In doing so, we also are able to study the impact of female political leadership in the absence of quotas or reservations. This is useful because the consequences of electing women that did not benefit from dramatic public policy intervention may be different from those who did.

Our data show that a negligible number of women participated in local politics until 1970, and their unconditional chances of winning were around 35%. However, about one-third of mayoral elections had at least one female candidate by 2005, and women win approximately 50% of these elections. There are also large differences in female participation across the country: women participate and win more often in cities with higher income and higher education levels, and that tend to be located in the western part of the country.

The lack of randomized assignment of women to mayoral offices represents an obvious empirical challenge to work on this topic. Differences in policy outcomes may be incorrectly attributed to the mayor’s gender given that cities in which women participate in local politics themselves have unique features that are correlated with certain types of policies. While some potential factors such as the fraction of highly educated people can be controlled for, there could be unobserved features of the community that both influence barriers to women’s political advancement and are correlated with policy outcomes.

A regression discontinuity (RD) design is employed to mitigate this problem. More specifically, we compare outcomes across elections in which a female candidate barely wins against a male candidate to those in which the woman barely loses to a male candidate. In practice, the RD design leverages vote shares as a single index of preferences for female leaders. It also allows the

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5 This is not to say that the existing literature always finds that gender systemically matters less in more economically advanced countries. Gagliarducci and Paserman (2009) also conclude that female political leadership does not materially influence policy outcomes in the Italian municipal sector. However, Funk and Gathmann (2008) report that women have different policy preferences than men in Switzerland, and that their representation as policy makers influences the composition of public spending in that country.

6 For recent overviews of RD, see Imbens and Lemieux (2008), and Lee and Lemieux (2009).
estimate of dynamic treatment effects on policy and political outcomes for over two decades after a female mayor wins a close election.\(^7\)

In contrast to most results reported in the literature, we find no impact of gender on a variety of local outcomes such as the size of city government as measured by total spending or employment, the composition of municipal expenditures and municipal employment, or local crime rates. These results imply that the settings in which women are politically empowered may influence the relevance of gender to policy outcomes. For example, it may be harder to change policy when individual women slowly take leadership positions, without the benefit of political quotas or reservations. Also, the nature of the political and economic environment in which cities compete in the United States does not provide much scope for redistributive policies. Tiebout sorting and local competition provide strong incentives for local leaders to implement policies that satisfy the desires of the local voters, even if they conflict with their own preferences which may be related to gender.

We also test for whether female mayors have higher unobserved skills.\(^8\) Even though city features are similar for close elections, voters still could have pre-determined (discriminatory) views about women that impair a female candidate’s chances of winning the election. In that case, women who “randomly” take office according to the RD approach still could have higher unobserved skills. Women with higher unobserved political skills should win re-election more often. We test for this using our panel of city elections and find that women are, indeed, more likely to win re-election than their male counterparts, with this gender gap being about ten percentage points.\(^9\) This higher likelihood of winning re-election does not translates in changes in policy in the second or later terms either, as we estimate negligible middle and long term changes in all our policy outcomes.

We also investigate whether randomly electing a woman mayor increases the political participation of other women in the same city. We find higher female participation and chances of winning an election in the first eight years, but this impact is mainly due to the candidacy and re-election of the incumbent female. Electing a female mayor does not produce immediate increases in

\(^7\) See Cellini, Ferreira, and Rothstein (2010) for an overview of dynamic treatment effects in a regression discontinuity design context. We explain our methods in detail in section IV.

\(^8\) In the legislative context, Anzia and Berry (2009) test for higher unobserved skills of Congresswomen by comparing how much they get to secure in Federal discretionary spending.

\(^9\) Beaman et. all (2008) argue that exposure to female leaders weakens stereotypes about gender roles and potentially eliminates the negative bias in how female leaders’ effectiveness is perceived among voters. Our approach does not disentangle the positive perception of the current effective female mayor and the overall weakness of stereotypes.
the participation of other females since the incumbent female naturally inhibits other women candidates. Moreover, no additional role model effects are perceived after one or two decades following the initial election. We also test whether a female mayor can generate spillovers to other elections, such as in local congressional districts. We find no evidence of short or long run spillovers, as women are not more likely to participate in or to win those legislative elections.

The plan of the paper is as follows. Section II presents our theoretical framework, and is followed in Section III by a detailed description of our data set. Section IV then explains the empirical research design, which is followed in Section V by the empirical estimates. Section VI concludes.

II. Female Leadership and Cities

Why would a female mayor implement different policies than a male counterpart? According to the classic work of Hotelling (1929) and Downs (1957), the party affiliation or policy preference of the politician should not impact policy outcomes. Even if a female candidate has different policy preferences than a male candidate, both would converge their policy platforms to cater to the preferences of the median voter.

This view of the political process was challenged by a number of empirical papers that showed divergence in policy along partisan lines. Alesina (1988) and Besley and Coate (1997) then developed the so-called citizen-candidate model to more coherently account for this divergence. In this framework, if candidates or parties care about certain outcomes and they cannot credibly commit to moderate policies, there will be divergence in the policies implemented by elected officials.

Analogously, female leaders could implement different policies provided they have distinct preferences. The literature suggests that females tend to prefer social expenditures in areas such as health. That mayors have executive power could facilitate the reallocation of resources in a city to serve one’s political preferences. The same holds for legislators, but they have to negotiate with other representatives to pass legislation, so the impact of a new female legislator may not be as

10 Besley and Case (2003) and Lee, Moretti, and Butler (2004).
11 Also see Wittman (1977, 1983) for early work on politicians’ tastes and partisanship.
12 Chattopadhyay and Duflo (2004).
effective, or it may be only noticeable when large participation shocks are observed (e.g., as when quotas are implemented).

Cities are different from state and federal government in many respects. In particular, they have certain characteristics that may reduce the scope for mayoral activism based on gender. Most localities are part of a larger labor market (or metropolitan) area, which can spur spatial sorting into specific types of communities as envisaged by Charles Tiebout (1956). This suggests that the populations of cities are likely to be more homogeneous, reducing the scope for divergence in policy. For example, greater homogeneity among citizens may facilitate politicians credibly committing to moderate policies according to ‘citizen-candidate’ models. City homogeneity also can limit the type of strategic extremism proposed by Glaser, Ponzetto and Shapiro (2005), since it becomes harder to win elections by catering to a thin minority with extreme preferences in such circumstances.

A Tiebout-type urban setting also creates more intense competition among jurisdictions, which may restrict a politician’s desire or ability to pursue gender biased policies if residents can readily move to a nearby town. Whether ‘Tiebout even needs politics’ has long been debated in urban economics (Epple and Zelenitz, 1981; Henderson, 1985). This issue has been studied by political scientists, too, with Peterson (1981) arguing that the competitive nature of the American urban environment limits the scope for redistribution at the local level. If this leads to a heightened emphasis on competence in the provision of basic services, the political gains to female mayors changing policy behavior could be smaller at the local level of government.13 Ferreira and Gyourko (2009) documented that political partisanship did not affect policy outcomes in U.S. cities, in great part because of these Tiebout-related mechanisms.

Finally, the types of policies relevant to local government also could play a role in mitigating the potential policy changes that come from electing a female leader. Economic responsibilities such as local taxation and the provision of basic services are the province of city government, while social issues such as abortion and gun control are not. If the gender divide is not wide on the issues central to local government, catering to gender differences is less useful as an electoral strategy. To

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13 The constraints need not be exclusively related to Tiebout competition, either. For example, balanced budget rules or scarce intergovernmental aid to cities also could limit the scope for redistribution.
mitigate this issue in our sample, we look at disaggregated employment data, where we can pin down employment related to health services, welfare services, housing, and safety, among others.

In sum, although female mayors potentially have broad scope to influence policy, it should not be presumed that the strong gender impacts on policy outcomes reported in other countries or at legislative levels of government also exist in the executive branch of cities in the United States. Independent analysis must be performed.

III. Data Sets

III.A. Mayoral Elections Survey Data

The mayoral election data used in this paper are an updated version of the sample described in Ferreira and Gyourko (2009). Most information is based on the responses to a survey sent to all cities and townships in the United States with more than 25,000 inhabitants as of the year 2000.\(^\text{14}\) Information was requested on the timing (year and month) of all mayoral elections since 1950, the name of the elected mayor and 2\(^{nd}\) place candidate, aggregate vote totals and vote totals for each candidate, party affiliation, type of election, and some additional information pertaining to specific events such as runoffs and special elections.

We use information from more than 5,000 elections held in almost 500 cities between 1950 and 2005. Table 1 in Ferreira and Gyourko (2009) provides summary statistics on the representativeness of the sample. Naturally, the cities in our sample are more populous than the typical jurisdiction in the country, given the 25,000 person cut-off of our survey. Bigger cities tend to have better educated households that earn more money and live in more expensive houses. They also have more minority households. Regionally, our sample is more heavily weighted towards the West and South; there are numerous small towns in the Midwest region that did not respond to the survey.

Our sample is fairly representative of the universe of municipalities with more than 25,000 residents. The cities in our sample have larger populations on average, but are quite similar on many other dimensions. Our cities are even more representative—in demographic, economic, and

\(^{14}\) Our analysis focuses on “strong mayors” that are directly elected by the population since they have more power to propose, change and veto the budget. Cities with “weak mayors” such as those appointed by the city council or those that hire professional managers to run the city, are not part of this study. See Baqir (2002) for evidence on the importance of strong mayors in determining local government spending, and Aghion, Alesina and Trebbi (2004) for the determinants of choice of electoral rules.
geographic terms--of the group that directly elects a mayor. Summary statistics for our final sample of 498 localities are displayed in Table 1.15

Figure 1 plots the number of observations over time. Not only is the sample growing over time, but there is a cyclical pattern due to a large fraction of cities with two-year term elections. Fifty-one percent of our elections are for 4-year terms, but 44% are for 2-year terms only, with 4% being for 3-year terms.

III.B. Gender of Mayoral Candidates

We use a two-step procedure to assign gender to the mayoral candidates in our sample. First, all given names are matched to a Census list of common first names.16 If the given name was estimated by the Census to be of a given gender more than 99% of the time, then the name was assumed be of that gender. For example, the Census data show that more than 99% of all those with the name “Robert” were male. Hence, any candidate whose first name was “Robert” is assumed to be male. Approximately 85% of our candidates had a distinctly male or female name based on this criterion. For those candidates with ambiguous names (e.g., Casey, Pat, Leslie), we searched for evidence of the person’s gender. This second step was done via internet searches, emails and phone calls. Internet searches typically were of local government websites and local newspaper archives of articles and photos. Similar searches were made in the cases where data on first names was missing.

Figure 2 shows the distribution of elections by gender of the 1st and 2nd place candidates over time, including the elections where we were unable to classify at least one candidate by gender. Elections with a missing gender are more common in earlier decades, while they correspond to less than 5% of the sample by year 2000. Overall, elections with 1st and/or 2nd place women candidates corresponded to less than 3% of all elections until mid 1970’s. By 2000, elections with at least one female candidate made up on-third of all elections.

Figure 3 plots the proportion of elections with a female candidate and the proportion of female victories after restricting the sample to elections where we know the gender of the 1st and 2nd

15 See Ferreira and Gyourko (2009) for more detail and an enumeration of the strengths of this survey compared to other sources of local election data.
16 US Census ‘Frequently Occurring First Names and Surnames From the 1990’ (part of the Census Data for Genealogical and/or Historical Research)
place candidates.\textsuperscript{17} The proportion of female victories is negligible before 1970, but rapidly increases to more than 15\% by 1995 before stabilizing, although the most recent data show a slight downturn in such wins. Figure 4 shows the raw probability of female victory over time, conditional on having a single female candidacy. Female candidates had less than a 50\% probability of winning from 1965 until mid-1990s. After that, this unconditional probability lines up very closely to 50\% line.

City characteristics of elections with and without female candidates are shown in Table 2. On average, elections with at least one female candidate are more likely to take place in the West census region, in places with a higher proportion of people with college degrees, higher family income and higher house prices. They are less likely to occur in the Northeast and in the South, Figure 5 documents that time series patterns in these local traits.

Finally, the party affiliation of women candidates over time is described in Figure 6. Prior to 1970, the very few women that ran for mayor were highly likely to be Democrats, although that sample is small. Since 1970, female candidates still are more likely to be Democrats, but the difference is narrower.\textsuperscript{18} Beginning in the mid-1980s, about 10\% of women candidates belong to independent parties. According to the latest data from 2005, 50\% are Democrats and 40\% are Republicans. Clearly, it will be important to control for the party affiliation of male and female candidates in all specifications.

\textbf{II.C. Local Public Finance Data}

Information on a variety of local public finance variables is merged with the elections data. The public finance data span the fiscal years 1950-2005 and were obtained from two different sources: the \textit{Historical Data Base of Individual Government Finances} (1970-2005), and the Census Bureau \textit{City Finances Series} (1950-1969). These data are based on a \textit{Census of Governments} conducted every five years, from \textit{Annual Survey of Governments} collected at every non-census year, and are complemented with state data provided by the Census Bureau. The local public finance variables include measures of revenues and taxes, spending (on current operations and capital goods), employment (full and part time), as well as distributional data regarding shares of spending on labor, public safety, and

\textsuperscript{17} It is worth noting that the characteristic of the cities with at least one missing piece of information about the gender of candidates are very similar to those that have two male candidates. The rest of analysis in this paper does not use elections with missing gender information.

\textsuperscript{18} Female voters also tend to vote more often for Democratic candidates. See Edlund and Pande (2002).
parks and recreation. We also tabulate results for some selected employment categories, such as health, welfare, leisure (parks, library, etc.), and infrastructure (roads, transit, gas, etc.). Summary statistics on these variables are discussed below in the context of our empirical analysis.

II.D. Crime Data

The following crime indexes are merged with the elections data in order to estimate the potential effect of party affiliation on the efficiency of the provision of police enforcement: murder and robbery (violent crimes), and burglary and larceny (property crimes). The crime data is available at the police district level from the Uniform Crime Reporting reports issued by the FBI and the Department of Justice. We aggregated those measures to the city level and constrained the sample from 1950 to 2005 to match the available fiscal data.

IV. Research Design

IV.A. Short-run outcomes

The potential endogeneity of the relationship between the gender of the mayor and local policy outcomes means that simple ordinary least squares (OLS) estimates cannot be used to identify a pure gender effect. For example, well-educated citizens could be more favorably disposed towards female executive leadership and higher levels of public spending. If so, an estimated gender effect that female mayors ‘cause’ larger government could be due, at least partially, to an unobserved (by the econometrician) third factor—namely, the preference of more educated people for public goods.

Our research design to deal with this issue follows Lee (2001, 2008). He notes that as long as there is some unpredictable random component of the vote, a narrowly-decided election approximates a randomized experiment. In other words, the correlation between the election outcome and unobserved district characteristics can be kept arbitrarily close to zero by focusing on sufficiently close elections. For our purposes, this means that one can identify the causal effect of electing a female mayor by comparing cities that barely elected a woman instead of a man (the “treatment group”) with others where a female candidate barely lost to a male (the “control group”).
We implement this RD strategy by retaining all of the data in the sample but absorbing variation coming from non-close elections using flexible controls for the vote share.\textsuperscript{19} The short run effect of electing a female leader on any local policy outcome (S) is estimated by the following equation:

\begin{equation}
S_{c,t} = \beta_0 + F_{c,t} \pi_1 + P(MV_{c,t}) + \eta_{c,t},
\end{equation}

where $S_{c,t}$ represents the policy outcome of interest in city $c$ in the term immediately following election $t$ (i.e., for the size of government variable, it is the scale of government in the subsequent mayoral term), $F_{c,t}$ is a dummy variable that takes on a value of one if a female won the mayoral race in election $t$ in city $c$, $P$ is a third order polynomial in the vote share, $MV_{c,t}$ refers to the margin of victory in election $t$ in city $c$ (defined as the difference between the percentage of votes received by the winner and the percentage of votes received by the second place candidate), and $\beta$ are the respective vote share coefficients.\textsuperscript{20} Thus, the pure gender effect, $\pi_1$, is estimated controlling for the margin of victory in linear, quadratic, and cubic form, as well as interactions of each of these terms with whether a woman won the mayor’s race in election $t$ in city $c$. We also worked with different functional forms to verify that our conclusions are robust to such changes, and experimented with including predetermined control variables.\textsuperscript{21} Standard errors are clustered at the city-decade level.

We are also interested in whether female mayors are more highly skilled than their male counterparts. As suggested by the conceptual discussion above, this could result if there is bias against woman leaders. In that case, they may need to possess extra political skill in order to win an election. If so, they should win re-election more frequently than males. This requires the estimation of an incumbent effect ($\gamma$), which reflects the increased probability of a woman winning the next election (presuming a woman won the previous one). We estimate the incumbent effect using observations at the candidate level, which allow us to estimate an average incumbent effect, and to

\textsuperscript{19} For a detailed comparison of this approach with an approach that uses data only from close elections, see Imbens and Lemieux (2008).

\textsuperscript{20} Margin of victory is used in lieu of the vote share in order to facilitate comparison across elections, as some have more than two candidates because of write-in ballots or independent candidates. Non-partisan elections can also have more than one candidate from the same party.

\textsuperscript{21} The RD design can be estimated parametrically or non-parametrically (see Lee and Card (2005) and Hahn, Todd and Van der Klaauw (2001), respectively). We follow a parametric approach since it allows for straightforward hypothesis testing. The proper order of the polynomial regression is still open to debate in the RD literature, although Porter (2003) argues that odd polynomial orders have better econometric properties.
separate incumbent effects for male and female candidates. Equation (2) provides an example of the type of specification for which we report results below:

\[
W_{i,t+1} = \lambda_0 + F_i \gamma_F + M_i \gamma_M + P_F(MV_{i,t} \lambda) + P_M(MV_{i,t} \lambda) + \nu_{i,t},
\]

where \(W_{i,t+1}\) is a dummy variable for whether the candidate in \(t\) was elected in \(t+1\), \(F\) and \(M\) stand for the gender of the candidate, \(\gamma_F\) and \(\gamma_M\) are the incumbent effect estimates by gender, and \(P_F\) and \(P_M\) are the polynomials in the vote share of those candidates.

The key underlying assumption is that a female (male) candidate who barely won an election has similar political ability to a female (male) that barely lost an election. The only difference is that one candidate randomly takes office and therefore enjoys the benefit of incumbency, which may impact the odds of winning the next election. We first estimate equation (2) using the whole sample, including elections where a male ran against a female. In practice, this specification implies that a female or male that barely won an election ran against a male candidate. When restricting the sample to only elections where a female ran against a male, we always have a female (male) winner against a male (female) contestant.

It is important to recognize a few limitations of the research design described above. First, the sample is restricted to elections where a female ran against a male to estimate policy outcomes. Therefore, the majority of elections where a male ran against another male are left out of the estimation. Second, we estimate local average treatment effects around the zero percent margin of victory threshold, and care should be used when extrapolating our results to elections far away from the discontinuity. Third, the underlying experiment is a female, of certain characteristics, running against a male. To the extent that those females have higher observed or unobserved ability, we will not be able to disentangle that from the gender effect. Even if we think about the margin of victory as an index of political skills, the existence of barriers to female participation in politics would likely induce only women of higher skills to obtain the same margin of victory of a man with relatively lower ability. We do know the party affiliation of those candidates though, so we can control for independent party affiliation effects using a double RD design suggested by Rehavi (2007). We present such robustness test in the next section.

**IV.B. Long-run outcomes and spillovers**

The long run effect of electing a female mayor is estimated using an augmented version of equation (1). We follow the strategy developed by Cellini, Ferreira, and Rothstein (2010) to estimate
dynamic treatment effects of electing a female leader. In our case, dynamics can arise from two sources: first, changes in policy outcomes may happen with a certain lag, since the policies implemented in one term may only have observable consequences in the following term. Second, there could be an indirect effect of electing a female leader on the probability of electing other female leaders in subsequent elections. This cumulative sequence of female leaders could result in changes in policy with even longer lags.

Consider again a city $j$ that had an election in year $t$. We can write the city’s outcome $\tau$ years later as

\[
S_{c,t+\tau} = F_c \pi_{\tau} + P(MV_{c,t}) \beta + \eta_{c,t+\tau}.
\]

In practice, equation (3) is inefficient because the error term may have important components that vary at the city level, at the calendar year level, or at year relative to election level. Therefore, more precise estimates of the $\pi_{\tau}$ parameters can be obtained by pooling data from multiple $\tau$ (including $\tau < 0$, corresponding to periods preceding the focal election) and including fixed effects at the city, calendar year, and relative years. This is implemented by selecting observations from city $c$ in years $t-4$ through $t+24$ relative to an election. Observations in the resulting data set are uniquely identified by the city, $c$, the date of the focal election, $t$, and the number of years elapsed between the focal election and the time at which the outcome was measured, $\tau$. We use this sample to estimate the following regression:

\[
S_{c,t} = F_c \pi_{\tau} + P(MV_{c,t}) \beta + a_t + \pi_{\tau} + \gamma_t + \eta_{c,t},
\]

where $a_t$, $\pi_{\tau}$, and $\gamma_t$ represent fixed effects for years relative to the election, for calendar years, and for mayoral elections, respectively. Both the $\gamma_t$ and $\pi_{\tau}$ coefficients are allowed to vary freely with $\tau$ for $\tau > 0$, but are constrained to zero for $\tau \leq 0$. Standard errors are clustered by city to account for dependence created by the use of multiple $(c, t)$ observations in the sample.\(^{22}\)

We also use equation (4) to test whether electing a female leader produces changes in the political participation of other women. Such role model effects often are considered to be an additional benefit of electing a female (or minority candidate) to a political office.

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\(^{22}\) The framework presented above estimates intent-to-treat effects of electing a female mayor. That is, these effects are a combination of electing a female leader, plus indirect effects given the higher probability of electing other females as mayor in the same city. We do not estimate treatment-on-the-treated effects – which isolate the impact of electing a female leader once– because they are likely to be lower than the total effect (which we already estimate to be close to zero). For more details on the econometric procedure, see Cellini, Ferreira, and Rothstein (2010).
IV.C. Validity of the Research Design

We present two tests of the validity of the research design. First, in Figure 7 we plot the histogram of density of mayoral elections by female margin of victory. There is no indication of discontinuity, or endogenous sorting, around the margin of victory threshold. Second, Figures 8A and 8B show a number of city characteristics in the year prior to the election by the female margin of victory. All dots represent unconditional means of the relevant variables by 2-point range of margin of victory, with the thick line reflecting a cubic polynomial fit, and the dashed lines the 95% confidence intervals. All sociodemographic features, population and geographic features show no sign of a discontinuity around the threshold. Overall, there seems to be little concern about the randomness of electing a female leader in close elections.

V. Results

V.A. Policy Outcomes

Table 3 reports estimates of gender effects based on specifications like equation (1), with the first column documenting means and standard deviations of each local policy outcome variable. The second column then reports results from our preferred specification, which includes a cubic polynomial, various city covariates (listed in the notes to the table), and a control for the relevant policy outcome in the year before the election. The latter control is helpful in reducing the estimated standard errors, but it does not affect the point estimates in any material way. These estimates indicate that the impact of having a female relative to a male mayor is negligible for the three groups of policy outcomes we consider: size of government, allocation of expenditures, selected employment categories, and crime rates.

For example, two of the size outcome measures reported in the top panel have positive coefficients and two have negative ones. However, all are small in economic terms and none are statistically different from zero. The 0.001 coefficient for total revenues per capita literally suggests that having a female mayor leads to those revenues being one-tenth of one percent higher. Total taxes per capita are smaller if the mayor is a woman, but only by 1.8%, and a null of zero cannot be

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23 Point estimates are available upon request.
rejected. Similar results apply to the allocation of resource outcomes reported in the middle panel. The biggest absolute effect is on the fraction of spending on salaries and wages; that is only 1.1% higher if the mayor is a woman and is indistinguishable from zero in any event. Selected employment categories have higher standard errors because fewer cities have such disaggregated data. Results for these variables do not present a pattern of gender-related impacts, and only the health category has a negative and statistically significant coefficient. This counterintuitive result is due more to the noisiness of the disaggregated employment data than to a pattern of change in policy, as we will see in the pictures below. All the crime index variable coefficients reported in the bottom panel also are small and statistically insignificant.

Because a picture really can be worth a thousand words for regression discontinuity estimates like this, Figures 9A-9D plot unconditional means for each group of policy outcomes. They also plot a prediction line based on an RD model with a cubic polynomial. Note that the size of government and allocation of resources and employment variables plotted in Figures 9A, 9B and 9C have a flat profile for any margin of victory or defeat. This indicates than even in cities where female candidates won or lost by large margins, different policies are not being implemented. Only Figure 9D has a negative slope, indicating again that cities with high crime rates are slightly more likely to elect male mayors. However, there is no evidence of any discontinuity for close races, as implied by the underlying regression coefficients reported in the bottom panel of Table 3.

The fact that these results are not sensitive to functional form assumptions or other controls is confirmed in the next two columns of Table 3, which report findings from a cubic polynomial with city covariates (but not outcomes in period t-1) and from a simple linear vote share specification. The point estimates on size of government are highest in the linear model (column 4), but they still do not indicate large gender effects, and none approach statistical significance at standard confidence levels. Smaller effects are found for some of the allocation of resource and crime outcomes from this specification, so there is no evidence that our choice of functional form is influencing the results in any systematic way.  

That gender effects on local public sector outcomes truly are close to nil is further suggested by the very small effects found even when running OLS. These results are reported in the

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24 We also estimated models with interaction terms that allowed the slopes to vary on the different sides of the discontinuity. In no RD specification do we ever find statistically or economically significant gender effects on any policy outcome.
final two columns of Table 3. Even though OLS provides upwardly biased estimates of the true gender effect, there is no evidence from the size of government and allocation of resource specifications that having a female chief executive of a city is associated with materially different policy outcomes, particularly if one controls for city traits.25 Some caution is in order here, as the standard errors tend to be larger especially when no city controls are included, so one cannot always conclude that the impact is a tight band around zero. There are two statistically significant results on the crime indexes (at the 95% confidence level). Both coefficients are negative and are from unconditional OLS specifications regressing the outcome measure on a dummy for whether the mayor is a woman. That the RD estimates for this outcome never are statistically significant and the negative slope plotted in Figure 7C both suggest that this negative correlation between crime indexes and female mayors reflects the fact that cities with lower crime rates are more likely to elect woman mayors.

V.B. The Incumbent Effect by Gender

Mayors are likely to be re-elected 54 percent of the time, an average that has been quite constant over the past 5 decades. These re-election rates are lower than the ones observed in the House of Representatives26, due at least in part to the fact that many cities employ term limits of some kind. Interestingly, female mayors appear to be more likely to be re-elected than the average mayor: 59% versus 53%.

Because unconditional probabilities of re-election capture not only the incumbent effect but also specific city features – e.g., by how much voter preferences are aligned with the mayor – Figure 10 presents the probabilities of election by gender and by margin of victory or defeat. The difference between election rates of candidates that barely win an election and those that barely lose provide quasi-experimental evidence of the incumbent effect.27 Focusing first on the left panel which is based on the entire sample, the probability that a candidate gets elected in \( t+1 \) is positively

25 This is in stark contrast to what we found for the impact of political party in our 2009 paper. For example, the unconditional effect of having a Democrat as a mayor was a 17% larger public sector workforce (per capita). Controlling for various city traits narrowed that difference to 9%, but it remained statistically significant at standard confidence levels. It was only in the RD specification which controlled for potential endogeneity that the partisan impact narrowed to zero. For gender, the estimates suffering from possible endogeneity bias are small.

26 Lee (2008) reports re-election rates of approximately 90%.

correlated with the candidate’s vote share in election $t$. Note that candidates who lost an election have similar probabilities of being elected in the next election, independent of their gender. However, women mayors are more likely to be re-elected than male mayors. The difference on the right side of the threshold in the left panel of Figure 10 is about 10 percentage points.

The right panel of Figure 10 constrains the sample to elections where a female ran against a male. Interestingly, male candidates that lost an election to a female are less likely to win the next election than a female candidate that lost an election to a male. The right hand side of the discontinuity still presents a similar result to that for the full sample, with female mayors more likely to be re-elected than male mayors. Albeit noisier, the difference is still about 10 percentage points.

Table 4 presents estimates and standard errors of the incumbent effect by gender for several specifications. The first column of Table 4 reports the unconditional incumbent effect, which is larger than estimates presented in the other columns that use a regression discontinuity specification akin to equation (2). The first panel estimates the incumbent effect by gender over the whole sample. Females have an incumbent effect of 52-54% depending on the RD specification, while males have a 43-45% effect. This difference is statistically significant in the linear and cubic case, but not when allowing for different slopes in either side of the threshold.

The next two panels investigate whether these results vary over time. The smallest differences in the incumbent effect between genders are observed before 1980 – with the exception of the specification that allows for different slopes, which is rather noisy. This is consistent with the notion that barriers to female participation were larger during that period, and that such barriers were also present when mayors were running for re-election. Estimates for the sample restricted to years after 1980 do not show much difference and line up with the 10% overall difference in incumbent effect by gender.

Finally, the last panel of Table 4 restricts the sample to elections where a female ran against a male. This guarantees that differences in the incumbent effect estimated above do not come from differential effects by city. Although these estimates are noisier because of the smaller number of observations, the incumbent effect for females is still 11-12 percentage points larger than it is for males.

Overall, these estimates indicate that women perform better in the ultimate political test once they assume office—namely, whether they will get re-elected. This result is consistent with our conception of female participation in local elections. Since women still face barriers to entry in
politics, the highest skilled women are the ones more likely to be candidates and to win an election. Once in office, they prove their skills by getting re-elected more often than their male counterparts.

That said, a threat to this interpretation is that men may have more options to climb the ladder in politics, by running for congress, for example. If that is the case, they are less likely to win re-election because they are less likely to run again for the mayoral office in the first place. Women may not have such options if discriminatory views are stronger at the congressional level, leading them to run more often for re-election at the city level. However, the data shows that only a small number of men, 102 or 2% of the total male mayors in our sample – run for congress, senate or state governor after becoming a mayor. This number is only 10, or 1.6%, for females, which indicates that such mechanism is not relevant to our analysis.

V.C. Long-run effects of electing a female mayor on local politics and local outcomes

We estimate the impact of electing a female mayor on long run political outcomes using a version of equation (3) that does not includes city fixed effects. Two specifications are presented: one with cubic controls for vote share (RD) and another without them (OLS). Figure 11 plots the estimated effects for every two years, over twenty-four years, for two outcomes: probability of female victory, and probability that the same female that won the focal election succeeds again in future mayoral run.

The left panel of Figure 11 plots the estimates for the effect of exogenously electing a female leader on the probability that any female will win future elections. The estimate at relative year 0 is one, since the focal elections mechanically compare cities where a female won versus cities where a female lost an election. By the second year, the probability of a female victory is approximately 60% in the OLS specification, and slightly smaller for the RD specification; this estimate declines to about 40% in year 4, 20% in years 6 and 8, and then it is not statistically different from zero by year 10, and through year 24. These results indicate a large effect, but only up through year 8. Estimates remain small and not statistically significant in the remaining relative years, although confidence

28 Most cities in our sample have two or four-year terms. When elections occur in odd years, we assign them to the subsequent relative year.
intervals are greater (especially for the RD specification) after two decades because of the small number of observations at those relative years.29

However, the right panel of Figure 11 provides clear evidence that this particular effect is mostly due to the re-election of the incumbent female herself. The incumbent female probabilities of re-election fully track the results obtained for any female through year 8, and the point estimates fade to zero by year 10 as well. That re-election probabilities fade by year 10 is in part due to the large fraction of cities with two-term limits. Interestingly, the successor of an incumbent female is not more likely to be a female, suggesting that it is difficult to find another female leader to govern or that the incumbent female did not nurture a political heir of the same gender.

Even though there is a negligible role model effect for mayoral elections, Figure 11 clearly showed a cumulative effect of female political leadership that lasts for almost a decade after the focal election. This raises the possibility that the one-term outcomes studied in Section V.A. could be different over longer horizons. Figure 12 presents the $\pi_\tau$ point estimates (from equation (4)) and confidence intervals for four local outcomes: total revenues per capita, total employment per 1000 residents, percentage of current expenditures spent on police, and the murder rate per 1000 residents. All estimates corroborate the short-run results, as there are not significant effects in any of the 24 lags since the election of a female mayor.

V.D. Spillovers to other elections

While there is a limited female role model impact of electing a female to the same mayoral office, a female mayor may still influence participation in other local elections. Figure 13 shows the probability of women winning elections for mayoral offices and for the House of Representatives. The probabilities for the House of Representatives usually lag about 5 to 10 years compared to those observed in mayoral elections. These descriptives suggest that barriers to female participation are harder to overcome in higher offices. In addition, the timing of female participation in these different offices could be caused by positive spillovers generated at the local level.

29 Only elections prior to 1985 can have estimates for relative years over 20. As we described before, that period has fewer elections in our sample, and it also had fewer female candidates.
We test for the presence of spillovers by estimating the impact of electing a female mayor on the probability that a female will participate or win a future congressional election. We assign districts to cities based on geography. Figure 14 presents point estimates based on equation (4). The left panel shows the probability that any female wins the election. Estimates are close to zero and not statistically significant for a decade. Point estimates seem slightly higher between years 10 and 20, but standard errors are also large. Again, this suggests a very limited role model effect. Finally, the right panel shows estimates for the probability that the incumbent mayor wins a seat in the House of Representative. There are no effects in the first ten years, allegedly because a large fraction of those successful females are still serving as mayors. But there is a subsequent small effect – about 3 percentage points – that the incumbent female will win a congressional election.

VI. Conclusion

This paper investigated the impact of gender on policy outcomes at the local level of government in cities and towns across the United States. In doing so, we looked at women in the executive branch of government, mayors to be specific. No impact of having a female chief executive was found on the size of local government, the composition of its expenditures, or local crime rates. A regression discontinuity design that compared outcomes in cities where a female barely won the mayor’s office to those in cities where a male barely won was employed to deal with potential endogeneity problems. However, upwardly biased OLS results also show only small, insignificant effects. It appears as if the Tiebout sorting and intense competition among local governments that our other work (Ferreira and Gyourko 2009) showed prevented political partisanship from influencing policy outcomes is at work here, too. While the precise causal mechanisms remain an open question, our findings indicate that the context in which female leadership is undertaken is important, so that one cannot simply extrapolate from studies finding strong gender effects in very different institutional and market settings.

We also investigated whether having a woman attain the top executive position in a local government leads to greater participation in future races, both for mayor and for congress. Somewhat surprisingly (given our priors), having a woman win the mayor’s office has virtually no positive impact on the probability of other females running for or winning political office. Almost all of the future increase in female participation is due to the woman who won in the first place.
Our results strongly suggest that female victors have superior political skills compared to otherwise equivalent males, as indicated by the fact that they are more likely to win reelection.

References


Rehavi, M. Marit. 2007. ‘Sex and Politics: Do Female Legislators Affect State Spending?’ Mimeo, University of California, Berkeley.


Table 1. Sample representativeness

<table>
<thead>
<tr>
<th></th>
<th>final sample</th>
<th>all US cities</th>
<th>cities with &gt;25000 population</th>
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<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
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<td>number of cities</td>
<td>498</td>
<td>34,574</td>
<td>1,893</td>
<td>877</td>
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<td>population</td>
<td>113,104</td>
<td>7,666</td>
<td>86,245</td>
<td>112,392</td>
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<td>(62,732)</td>
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<td>(346,409)</td>
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<td>0.12</td>
<td>0.24</td>
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<td>(0.41)</td>
<td>(0.33)</td>
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<td>(0.39)</td>
</tr>
<tr>
<td>% south</td>
<td>0.29</td>
<td>0.24</td>
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<tr>
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<td>% north</td>
<td>0.14</td>
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<td>0.88</td>
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<td>% college degree</td>
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<td>0.17</td>
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<td>0.26</td>
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<td>(16,265)</td>
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<td>median house value</td>
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<td>$100,526</td>
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<td>(66,961)</td>
<td>(86,412)</td>
<td>(100,769)</td>
<td>(70,988)</td>
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</table>

Notes: All variables are based on the 2000 Census. Column 1 presents descriptives for the mayoral election sample used in this paper. Column 2 reports descriptives for all cities in the US. Column 3 restricts the sample to cities with more than 25,000 people as of year 2000. Column 4 additionally constrains the sample to cities that directly elect a mayor.

Table 2. City characteristics by gender participation

<table>
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<th>elections with female participation</th>
<th>elections without female participation</th>
<th>difference in means</th>
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<tr>
<td></td>
<td>avg</td>
<td>std</td>
<td>avg</td>
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<tr>
<td>population</td>
<td>107,363</td>
<td>374,062</td>
<td>106,462</td>
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<td>% northeast</td>
<td>0.162</td>
<td>0.426</td>
<td>0.196</td>
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<tr>
<td>% midwest</td>
<td>0.249</td>
<td>0.487</td>
<td>0.253</td>
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<tr>
<td>% south</td>
<td>0.245</td>
<td>0.532</td>
<td>0.312</td>
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<tr>
<td>% west</td>
<td>0.284</td>
<td>0.44</td>
<td>0.191</td>
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<tr>
<td>% white</td>
<td>0.750</td>
<td>0.716</td>
<td>0.778</td>
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<tr>
<td>% college degree</td>
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<td>0.209</td>
<td>0.201</td>
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<td>family income</td>
<td>52,586</td>
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<td>48,556</td>
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<td>log family income</td>
<td>10.83</td>
<td>9.50</td>
<td>10.757</td>
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<td>median house value</td>
<td>134,993</td>
<td>118,621</td>
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<td>log median house value</td>
<td>11.71</td>
<td>10.20</td>
<td>11.544</td>
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Table 3. Percentage difference in policy outcomes between female and male mayors, OLS and RD

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<tr>
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<tr>
<td></td>
<td>(std)</td>
<td></td>
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<td>size of government</td>
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<td>total revenues per capita</td>
<td>1,164</td>
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<td>total taxes per capita</td>
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<td>(0.079)</td>
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<td>total expenditures per capita</td>
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<td>(798)</td>
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<td>total employment per 1000 residents</td>
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<td>% spent with fire department</td>
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<td>(0.008)</td>
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<td>% spent with parks and recreation</td>
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<td>(0.013)</td>
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<td>(4.416)</td>
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</tbody>
</table>

Notes: Column (1) presents averages and standard deviations for all dependent variables, while Columns (2) to (6) report coefficients from RD and OLS regressions of each dependent variable indicated in the table on an indicator variable for whether the mayor is a woman and other controls. The RD specification controls for female margin of victory as described in equation (1) in the text. All size of government variables were transformed to logs. The set of covariates used in columns (2),(3),(4) and (6) are city population, median income, percentage of white households, percentage of households with college degree, homeownership rate and the median house value. Year and region fixed effects also are included. Column (2) also includes a control for the respective dependent variable at the year prior to the election. The number of observations is 735. Reported standard errors are clustered by city and decade.
### Table 4. Incumbent effect by gender

<table>
<thead>
<tr>
<th></th>
<th>unconditional</th>
<th>linear vote share</th>
<th>cubic vote share</th>
<th>cubic interacted with win</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>all elections</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>female candidates</td>
<td>0.563</td>
<td>0.544</td>
<td>0.521</td>
<td>0.527</td>
</tr>
<tr>
<td></td>
<td>(0.023)</td>
<td>(0.027)</td>
<td>(0.032)</td>
<td>(0.064)</td>
</tr>
<tr>
<td>male candidates</td>
<td>0.506</td>
<td>0.454</td>
<td>0.431</td>
<td>0.432</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.015)</td>
<td>(0.018)</td>
<td>(0.027)</td>
</tr>
<tr>
<td><strong>year &lt;=1980</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>female candidates</td>
<td>0.487</td>
<td>0.464</td>
<td>0.459</td>
<td>0.756</td>
</tr>
<tr>
<td></td>
<td>(0.073)</td>
<td>(0.087)</td>
<td>(0.095)</td>
<td>(0.209)</td>
</tr>
<tr>
<td>male candidates</td>
<td>0.48</td>
<td>0.44</td>
<td>0.403</td>
<td>0.406</td>
</tr>
<tr>
<td></td>
<td>(0.014)</td>
<td>(0.028)</td>
<td>(0.034)</td>
<td>(0.050)</td>
</tr>
<tr>
<td><strong>year &gt;1980</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>female candidates</td>
<td>0.573</td>
<td>0.55</td>
<td>0.529</td>
<td>0.521</td>
</tr>
<tr>
<td></td>
<td>(0.023)</td>
<td>(0.029)</td>
<td>(0.034)</td>
<td>(0.068)</td>
</tr>
<tr>
<td>male candidates</td>
<td>0.528</td>
<td>0.458</td>
<td>0.44</td>
<td>0.445</td>
</tr>
<tr>
<td></td>
<td>(0.011)</td>
<td>(0.017)</td>
<td>(0.020)</td>
<td>(0.033)</td>
</tr>
<tr>
<td><strong>Only male vs female elections</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>female candidates</td>
<td>0.589</td>
<td>0.563</td>
<td>0.493</td>
<td>0.522</td>
</tr>
<tr>
<td></td>
<td>(0.027)</td>
<td>(0.036)</td>
<td>(0.043)</td>
<td>(0.077)</td>
</tr>
<tr>
<td>male candidates</td>
<td>0.478</td>
<td>0.447</td>
<td>0.372</td>
<td>0.412</td>
</tr>
<tr>
<td></td>
<td>(0.028)</td>
<td>(0.042)</td>
<td>(0.052)</td>
<td>(0.088)</td>
</tr>
<tr>
<td><strong>covariates</strong></td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>linear vote share</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>quadratic and cubic vote share</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>vote shares interacted with win</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
</tr>
</tbody>
</table>

Notes: This table reports coefficients from regressions of a dummy variable for whether a candidate win election at time t+1 on the dummies for the gender of winner candidate in election t. The RD specification controls for female margin of victory as described in equation (1) in the text. The set of covariates used in columns (2),(3),(4) and (6) are city population, median income, percentage of white households, percentage of households with college degree, homeownership rate and the median house value. Year and region fixed effects also are included. Panels (1), (2) and (3) include all elections for the relevant years, while panel (4) constrains the sample to female vs. male elections only. Reported standard errors are clustered by city and decade.
Figure 1. Number of elections

Figure 2. Type of election by gender of candidates, by year
Figure 3. Proportion of elections with at least one female candidate and proportion of female wins

![Graph showing the proportion of elections with at least one female candidate and the proportion of female winners over the years 1950 to 2005.]

- **Legend:**
  - `--` elections with female candidates
  - `--` elections with female winners

Figure 4. Fraction of female victories when running against a male, by year

![Graph showing the fraction of female victories when running against a male from 1950 to 2005.]

- **Legend:**
  - `--` fraction of female victories
Figure 5. Average city characteristics by elections with and without female participation, by year

A. Income, House Values, Race and Education

B. Population, northeast, west, and south
Figure 6. Proportion Democratic and Republican Party female candidates

Figure 7. Density of elections with female participation
Figure 8. City characteristics prior to female candidacy, by female margin of victory

A. Sociodemographics

B. Population and Geography
Figure 9A. Size of government variables by female margin of victory

Figure 9B. Composition of expenditures by female margin of victory
Figure 9c. Selected employment categories by female margin of victory

Figure 9d. Crime rates by female margin of victory
Figure 10. Male and female candidate probability of winning next election, by margin of victory

Figure 11. Impact of electing a female mayor on female long-run political participation in a city
Figure 12. Impact of electing a female mayor on long run policy outcomes

![Graph showing the impact of electing a female mayor on long run policy outcomes.](image)

- Log total revenues per person
- Log total employment
- % spent with police
- Murder rate

Figure 13. Female probability of victory by type of election

![Graph showing female probability of victory by type of election.](image)

- Female mayors
- Congresswomen
Figure 14. Impact of electing a female mayor on female participation in local congressional elections.