ORIGINAL ARTICLE

Spillover effects of quota or parity laws: The case of Ecuador women mayors

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Abstract

This article considers whether quota or parity laws designed to improve the representation of women in plurinominal elections have a spillover effect to uninominal elections. It tests empirically the effects of quota and parity legislations implemented in Ecuador for plurinominal elections on the proportion of women elected as mayors. Based on an unpublished database, our results show that, after the implementation of such legislation, the probability of a woman being elected as mayor almost doubles (ceteris paribus). We also find evidence that a possible causal chain effect of the documented spillover effects is the increasing importance of female role models, motivated by institutional changes shaped by the new legislation.

KEYWORDS

spillover effect, subnational politics, women in politics, women mayors

INTRODUCTION

The presence of women in politics around the world has increased in recent decades, yet this growth is not homogeneous across the different decision-making arenas (Htun & Piscopo, 2014). In some countries, such as Argentina and Mexico, the number of female legislators has increased faster than that of female ministers (Annesley et al., 2019). In other countries, such as Guatemala and Venezuela, women now hold half of the benches on Supreme Courts, but their representation in the legislative branch and the ministerial cabinet remains marginal. Costa Rica, and to a lesser extent Ecuador, are outstanding in this respect, having experienced a homogenous increase of women in legislatures, ministries, and high courts. In part, the nonhomogenous implementation of parity laws and quotas can explain nonhomogenous increases in woman participation. Quota laws mandate that political leaders nominate specified percentages of women for national elections, 50% in the case of parity laws (Franceschet et al., 2012; Franceschet & Piscopo, 2008).

Still, implementation of these laws is generally only possible for plurinominal elections, such as those held for legislators, and not for uninominal elections, such as for mayors or presidents. In this article, we argue that institutional reforms such as quota or parity laws designed to improve the representation of women in plurinominal elections have a spillover

effect by which they increase the representation of woman in uninominal elections. We test this theory empirically by analyzing the effects of quota and parity legislations implemented for legislative (plurinominal) elections in Ecuador from 1998 to 2008, on the proportion of women elected as mayors.

Our empirical tests confirm our thesis. We find that implementing legislative quota and parity laws has a positive and statistically significant effect on the probability of a woman being elected as mayor. Our results show that, after the implementation of such legislation, the probability of a woman being elected mayor almost doubles (ceteris paribus).

Two lines of existing literature provide the theoretical background for such effects. First, under the new institutionalism approach, spillover effects can be explained by changes in formal or informal institutional rules that affect political behavior. Recently, several studies have emphasized the importance of institutions in gender representation and other areas (Mackay et al., 2010). The main idea in these works is that gender constructions are intertwined in the daily life or logic of political institutions. Thus, formal (or informal) changes in these institutions may have broader effects, like contagion effects across all political institutions. In Ecuador, the changes in the quota or parity regulations for plurinominal legislative elections may have created institutional changes that influenced uninominal elections.

Second, our results can be explained by a policy diffusion approach, defined as the process by which institutions, practices, behaviors, or norms are transmitted among individuals, social systems, or both (Piatti-Crocker, 2019). This approach has mostly been used to explain how policy waves spread across countries (Krook, 2009; Most et al., 1989; Piatti-Crocker, 2011; True & Mintrom, 2001). We argue that the diffusion effect may operate not only in the international environment but also within countries. Thus, institutional designs seeking to reduce gender inequalities can produce beneficial results in political arenas for which they were not directly designed.

Identifying empirically the specific causal chain driving this spillover effect is a complex task, due to data availability limitations. Still, our data set allows us to explore indirectly a possible causal chain for this spillover effect. We argue that the implementation of quota or parity laws for plurinominal elections and the consequent increase in the number of women elected as legislators increases the number of female role models, helping drive the motivation of other women to run for office (Piatti-Crocker, 2019). As more women are elected to office, their political role becomes more broadly accepted; hence, more women develop political ambitions and more female candidates find support among voters for uninominal elections (Wängnerud, 2009). We find indirect empirical evidence supporting this causal chain, since the probability of electing a female mayor increases when the province has a larger proportion of female legislators.

Analyzing the participation of women in municipal governments is critical for several reasons. First, municipalities meet many of the citizens' immediate needs more than other government institutions, evidencing the nature of the substantive representation of mayors (Van Donk, 2011).[1] Second, in the elections of mayors there is no direct influence from institutional features aimed at improving the representation of women, so these effects are controlled.[2] The presence of Latin American women in politics has been primarily studied in relation to institutions at a national scale, to the detriment of subnational decision-making arenas such as municipal governments (Hinojosa & Franceschet, 2011; Navarro & Sanz, 2018; Sundström & Stockemer, 2015; Van Donk, 2011).[3] To fill this gap, we analyze comprehensively the main drivers affecting the election of female mayors.

To the best of our knowledge, we are the first to analyze spillover effects for women in uninominal elections (mayors) as the result of quota legislation designed for plurinominal elections (legislators). Two previous studies closely related to ours are those performed by Shin (2014) and Davidson-Schmich (2016). Shin's (2014) study for South Korea analyzes how the presence of a quota law in a mixed proportional representation system influences parties to

feature women as candidates in single-member districts that are also under quota laws. The author argues that when political parties are pressured to fulfill gender quotas in single-member district seats, they tend to look for female incumbents who have already demonstrated their performance during their proportional representation term. Our study differs from Shin's (2014) in that we analyze the spillover effect to uninominal elections that are not under any quota legislation.

Davidson-Schmich (2016) studies the possible spillover effects from quotas on the proportional representation level of the Bundestag into the plurality level in the political parties, where quotas do not apply. Some political parties impose these quotas, which change over time, so it is difficult to make direct conclusions about possible spillover effects from this study. Moreover, Davidson-Schmich's (2016) empirical evidence includes the 2009 and 2013 elections in Germany, years in which quotas for proportional representation were already in effect. Our study comprises a larger sample that includes elections before and after the implementation of quota laws, allowing for the identification of possible spillover effects in a natural experiment setting.[4]

Our analysis is also related to studies analyzing the spillover effects of gender quotas to higher positions in other branches of government. For example, studies based on data from Italy and Sweden show that legislated quotas increase the probability that women will reach leadership positions above and beyond the quota mandate (De Paola et al., 2010; O'Brien & Rickne, 2016). Meanwhile, Bagues and Campa (2020) fail to establish similar evidence in Spain. On the other hand, with evidence from Lesotho, Clayton (2015) shows that a quota-mandated female representative reduces women's self-reported engagement with local politics.[5]

Our article has five sections. In the first section, we discuss the main contributions offered by specialized literature. In the second section, we develop a parsimonious theoretical framework for the spillover effects on uninominal elections of institutional reforms designed to improve the representation of women in plurinominal elections. In the third section, we describe the methodological strategy followed for the measurement of variables and for the empirical verification of the hypotheses. In the fourth section, we present and discuss the empirical findings. In the final section, we analyze the theoretical implications of the presence of women in municipal governments and offer some conclusions.

WOMEN IN MUNICIPAL GOVERNMENTS: A DEFICIT

Many of the variables that explain the increase of women in municipal governments come from modernization theory (Norris & Inglehart, 2001). According to this framework, as countries improve their education levels, they witness an initial increase in their economically active female population. As a result, women become steadily more involved in political life, mainly through participation in the legislature. In a subsequent second phase, the country's labor marker undergoes a rearrangement, and the population is encouraged to participate in large, public social groups. In general, during this second phase, the civic values of citizenship revolve around the demand for greater democratic freedoms (Inglehart, 1990; Inglehart & Welzel, 2005; Sugarman & Straus, 1988). This scenario would be favorable for increasing the presence of women in a variety of political decision-making arenas.

For authors who agree with the theory of modernization, the changes that occur in the first phase (transition from agricultural to industrialized societies) and the majority of those that happen in the second (transition from industrialized to postindustrialized or postmaterialist democracies) are primarily seen in more cosmopolitan areas (Kaldor, 1970). Expanding on this idea, researchers who study the presence of women in municipal governments take urban regions as a proxy of cosmopolitan areas. Thus, there would be a more significant presence of women mayors in urban than in rural areas, although empirical evidence verifying this

hypothesis is limited to countries such as the United States, Australia, the United Kingdom, Finland, and Canada (Borisyuk et al., 2007; Conroy, 2011; Holli, 2011; Smith et al., 2012; Tolley, 2011). Following the logic that more significant modernization of societies is reflected in the improvement of citizen welfare, one of the main variables the literature has identified as being decisive in the increase of female mayors is the education level of the population. The argument is that the idea that there is a disparity between the capabilities of men and women to hold an elected office vanishes among society as citizens achieve more formal academic knowledge.

Consequently, cities with a higher education level are more likely to elect female mayors. This hypothesis has been tested in the United States and Europe. In both geographical contexts, there is agreement that educational level has a positive influence on the increase not only of female mayors but also of female councilors (Holman, 2017; Smith et al., 2012; Sundström & Stockemer, 2015). Likewise, an increase in the female population participating in the labor market is repeatedly mentioned as a key variable to explain the involvement of more women in municipal governments (Nelson, 1991; Sanbonmatsu, 2002; Studlar & Matland, 1994). In general, the argument is that the increasing presence of women in economic activities not only contributes to reducing such asymmetries but also gives women a more active role within society (Iversen & Rosenbluth, 2008; Matland, 1998; Paxton, 1997). In the political context, an increased female presence in an economically active population will not only make decision-making arenas more accessible to women but will also increase the chances that they will win popularly elected offices (Kenworthy & Malami, 1999).

From a different perspective, specialized literature has reported that the increase of women in national politics constitutes a "trigger" of opportunities for more female actors to engage in public decision making at the municipal level (Barnes & Burchard, 2013; Bjarnegard, 2013; Campbell & Wolbrecht, 2006; Fox & Lawless, 2010; Pini & McDonald, 2011; Smith et al., 2012; Sundström & Stockemer, 2015; Wolbrecht & Campbell, 2007). Although much of the research focuses on industrialized democracies, there are also empirical findings for Latin America. For instance, Vásquez García (2010) reports a positive relationship between national and subnational women representation in some Latin American countries, although the increase in female legislators occurs faster than that of female mayors (Massolo 1996, 2006). In Brazil, Meier and Funk (2017) have shown that the increase in female political actors in popular election positions at the national level positively affects the number of women appointed to lead public agencies.

Other research argues that population density influences the number of female mayors in an area. With the gender-based disparity that exists in the political market, the argument is that women are more likely to hold government offices in arenas where there is less power. Given that there would be fewer resources, political and otherwise, to distribute in cities with smaller populations, these cities are more likely to have women elected as mayors. In this regard, there is positive empirical evidence carried out in several studies on Europe and the United States (Gidengil & Vengroff, 1997; Holman, 2017; Ruiloba Núñez, 2014; Smith et al., 2012). This relationship between variables has also been proven in some regional elections in Mexico and other Latin American countries (Barrera & Aguirre, 2003; Fernández, 2003; Massolo 1995, 2003; Vásquez García, 2010).

Some gaps emerge from the review of previous research on the representation of women in municipal governments. First, there is a relative absence of research on the effect generated by institutional reforms aimed at plurinominal elections compared to those of uninominal elections. Indeed, although institutional arrangements such as quota or parity laws are primarily designed to improve the representation of women in legislative elections, a positive externality of such modifications could be seen in the increase of female mayors. Second, the few works on female representation in the municipal sphere focus on the presence of female councilors, leaving aside the study of those who exercise executive power at that level,

such as female mayors. Although we are aware of the relevance of researching the structure and composition of municipal collegiate bodies, we believe that the analysis of who directs and executes municipal policy is key to assessing to what extent women have achieved higher offices of political power.

Third, works that examine the presence of female mayors tend to be synchronic, and are therefore less suited to the analysis of the historical evolution of female representation. Fourth, most of the research is focused on Europe and the United States, leaving behind other geographical contexts that, due to different social, economic, and political realities, deserve separate consideration. Such is the case of Latin America, where existing intensive research is focused only on Mexico and Argentina. The fact that both these countries have federal governments also suggests that studies relating to their political systems entail certain characteristics that are not the same in the case of unitary democracies, such as those of most Latin American countries. In the following section, we propose a theoretical framework in which we maintain that institutional reforms aimed at improving the representation of women in plurinominal elections have an indirect effect on uninominal elections, such as those of female mayors. We highlight the importance of changes in the institutional design in the increase in the number of female candidates and in the number of elected female mayors. Furthermore, we consider the specific weight that other variables, including those related to the theory of modernization and to the political and social context, could generate in descriptive representation in municipal governments.

FEMALE MAYORS: A SPILLOVER EFFECT

We argue that, although the institutional design of affirmative action or positive discrimination mechanisms seeks to generate incremental effects on the inclusion of women in plurinominal electoral processes, they also indirectly increase the presence of female political actors competing in uninominal elections. Thus, an increase in the number of elected female mayors may be partially explained as an indirect effect of the institutional reforms aimed to increase the number of women in collective decision-making arenas such as legislatures. As a result, we propose that the presence of institutional devices aimed at encouraging a greater presence of women in collective bodies generates a spillover effect that affects female actors who seek access to single-person political decision-making arenas, such as municipal governments.

Other factors may have also contributed to intensify such a spillover effect. For example, a larger number of female members of the legislature may constitute an important "trigger" for voters to elect female candidates in municipal elections. Thus, greater female participation at the national level will be replicated at the local level. Institutional reforms could, therefore, have an attitudinal effect on voters.

Also, the social context in which a country's elections develop may benefit the participation and election of women in single-member elections. Specifically, as discussions about women's rights gain room in public forums, voters may be more inclined to elect female candidates. Moreover, if quota or parity laws are the result of the mobilization of women and the enactment of their demands in public policy, the increase in elected female mayors can also be justified at the contextual level. An increase in the public discussions about asymmetric gender representation in politics could have a positive influence on the decision of voters in uninominal elections.

As we explain in the Introduction, the spillover effects can be viewed in the framework of the new institutionalism approach (Childs, 2013; Krook & Mackay, 2011; Mackay et al., 2010). Since gender constructions are intertwined in the daily life or logic of political institutions, formal changes in these institutions, driven by new legislation, may create contagion effects across all other political institutions.

Moreover, the spillover effect can be explained by the diffusion approach, discussed in several studies on women and politics (Most et al., 1989; Piatti-Crocker, 2011, 2019; Piatti-Crocker et al., 2017; True & Mintrom, 2001). This approach argues that changes in institutions, practices, behaviors, or norms can be transmitted among individuals, social systems, or both. The diffusion approach has commonly been used to explain the expansion (contagion) of quota laws in Latin America (Htun & Jones, 2002; Krook, 2009; Piatti-Crocker, 2011; Piscopo, 2015). It can also be applied to understand how these quota laws, which are aimed at multi-member elections, benefit women indirectly in single-member elections.

This positive spillover effect can be viewed as a palliative measure, given the impossibility of creating specific institutional mechanisms to reduce asymmetries between men and women in uninominal elections. Yet, the speed with which these changes cause an effect is not the same at the uninominal and plurinominal levels. In fact, it is expected that the direct effect of the new institutional design will be stronger than the indirect effect; at least in the first years, the number of female legislators would increase faster than the number of female mayors. This idea is consistent with the theoretical arguments of the new institutionalism and diffusion models because institutions and practices take time to adapt, which has to do with cultural particularities or the context in which these practices will be applied (Piatti-Crocker et al., 2017). Our first hypothesis explores how institutional changes directed at plurinominal elections may generate a spillover effect in uninominal elections.

> **H1**: *The presence of institutional designs aimed at increasing the presence of women in plurinominal elections, such as legislative ones, increases the likelihood of women being elected in uninominal elections, such as those of mayors.*

We also explore possible causal mechanisms that allow this externality to take effect. We argue that the implementation of quota or parity laws for plurinominal elections and the consequent rise in the number of women elected as legislators increases the number of female role models, thereby bolstering the motivation of other women to run for office. When it is time to decide whom to vote for in municipal uninominal elections, voters observe the nature of variables related to the political, social, or economic context that surrounds them. The number of legislators representing their most immediate geographical space, such as provinces, states, or departments—depending on the administrative distribution of each country—would be among these variables. Thus, if voters observe that there are more women in the legislative body, it generates enough incentive for the electors to give their votes to a female candidate for mayor. This fact is related to theories stating that the availability of role models could help to redress the gender gap by shaping the motivation of women to run for office. Thus, women's representation can be seen as a virtuous circle; as more women are elected to office, their political role becomes more accepted, such that more women will develop political ambitions and more female candidates will find support among voters (Wängnerud, 2009).[6]

Our second hypothesis argues that the increase of women in political arenas in a plurinominal election, such as the legislature, can have a positive effect on the rise of women in arenas of a uninominal election, such as the mayor's office.

> **H2**: *As the number of female legislators increases, the likelihood of women being elected as mayor increases.*

We also test the effects of the quota or parity legislation on the proportion of female candidates running for uninominal elections. An increase in such a proportion can be seen as indirect evidence of an increase in the political power of women within their political parties,[7] leading to an increase in the probability of them being selected as candidates for uninominal elections (Franceschet & Piscopo, 2014; Hennings & Urbatsch, 2015; Prihatini, 2019; Roza

et al., 2010). Still, it is a long causal chain, and our empirical measure of the political power of women (the proportion of female candidates) is very noisy. Due to these data limitations, our results should be taken only as suggestive, especially since previous literature has found evidence that political parties are highly resistant to nominating female candidates despite quotas (Davidson-Schmich, 2016; Funk et al., 2017; Morgan & Hinojosa, 2018). Our third hypothesis is as follows.

H3: *The presence of institutional designs aimed at increasing the presence of women in plurinominal elections, such as legislative ones, increases the number of women being selected as candidates in uninominal elections, such as those of mayors.*

Our empirical model also includes as control variables other drivers that existing literature has identified as influential for female representation in uninominal elections. First, modernization theory proposes that there is a higher level of development in urban areas, resulting in the modification of citizen values, making citizens more likely to search for significant equity in the representation of men and women (Norris & Inglehart, 2001). Per this theory, if the territorial district in which the municipal election is held is urban, the number of female candidates for mayor should increase, as should the likelihood of a woman being elected as mayor. In line with the previous argument, the education level of the population is a decisive variable related to the representation of women in the different arenas of political decision making. In the specific case of the mayors' offices, the argument is that if the voters have more academic training, this knowledge will influence them so that they seek to reduce the disparities between men and women in the political sphere (Holman, 2017; Smith et al., 2012; Sundström & Stockemer, 2015). If voters seek to achieve equity in gender-based political representation, this desire would be reflected in the appointment of more female mayors. Thus, it is expected that, as the education level of the population increases, the likelihood of women being elected as mayors increases, along with the number of female candidates for mayor.

A higher presence of women in the labor market could also be related to female representation in decision-making political arenas. In this case, the empowerment of women would come from their increased economic autonomy and the reconfiguration of their role in society. Thus, transferring female activity to the economic sphere constitutes a "trigger," so there will be a greater presence of women in public offices (Inglehart & Welzel, 2005; Inglehart, 1990; Sugarman & Straus, 1988). Thus, as the economically active female population increases, the likelihood of women being elected mayors increases, and the number of female candidates for mayor increases.

Finally, previous research has found that if the position of a popular election has more political power—economic and social resources included—it is less likely that women will be elected to this position (Holman, 2017; Smith et al., 2012; Vásquez García, 2010). A common proxy variable used to measure the degree of political power is the size of the population over which the appointed authority will have power. In other words, cities with large populations are less likely to have a woman as mayor. As the size of the city population increases, the likelihood of women being elected as mayor decreases, and the number of female candidates for mayor decreases.

In the next section, we discuss the methodological strategy applied to test the proposed hypotheses empirically. We start with a description of the Ecuadorian case, specifically of the essential political and electoral characteristics surrounding the elections of mayors. Then, we explain the mechanisms that we use to get the necessary information to build the variables. We also discuss briefly how the proportion of women mayors has evolved during the analyzed period and examine the effects of some of the explanatory variables. Finally, we discuss the regression models, including logistic regressions and penalized logistic regressions to control for rare events (Firth, 1993; Heinze & Schemper, 2002).

METHODOLOGY AND DATA

To verify empirically the hypotheses posited in this article, we analyze Ecuadorian male and female elected mayors and the proportion of female candidates between 1979 and 2019. Ecuador is an excellent laboratory in which to study the changing prevalence of female mayors for many reasons. First, for almost a decade this country has had quota or parity laws that are among the most progressive in Latin America (Caminotti & Freidenberg, 2018). Second, while studies have been performed on the exponential increase in the number of women legislators, ministers, and especially Supreme and Constitutional Court judges in Ecuador over the past decade, we know much less about how many women preside over municipal governments. Third, since the return to a democratic regime, the election of mayors in Ecuador is carried out in uninominal districts.[8]

Mayoral elections in Ecuador take place every 4 years, and until 1996, they were held at the same time as the presidential election. As of that year, aside from 2009, the elections of mayors take place in the middle of the presidential term. In total, 10 such processes have been carried out, and there have been 1949 mayors, with some of them holding office for more than one term. Since 1988, it has been possible to participate in these electoral processes without being affiliated with any political party. Although the elections are held in uninominal districts, candidates for mayor may present themselves as part of a political party or movement that also offers a list of candidates running for the municipal council. For the election of mayors, there is no run-off election, so whoever obtains a simple majority of the votes is awarded the office for 4 years. The number of cantons has been increasing over time, and ranges from 122 at the beginning of the democratic period (1979) to 221 in the last two electoral processes (2014 and 2019).[9]

To measure the presence of female mayors, we collect data on elected mayors, men and women, in each canton in the year of the electoral process. Our sample includes 1949 ($N = 1949$), corresponding to mayors elected in the 10 electoral processes carried out between 1979 and 2019.[10] With this information we create a dichotomous variable, *Woman mayor$_{it}$*, which takes the value of 1 if the elected mayor of canton *I* in period *t* is a woman, or 0 if it is a man. The mean of the variable *Woman mayor$_{it}$* during the studied period is 3.50%. The lowest female representation is 0.82%, recorded in the period 1979–1984, while the most significant
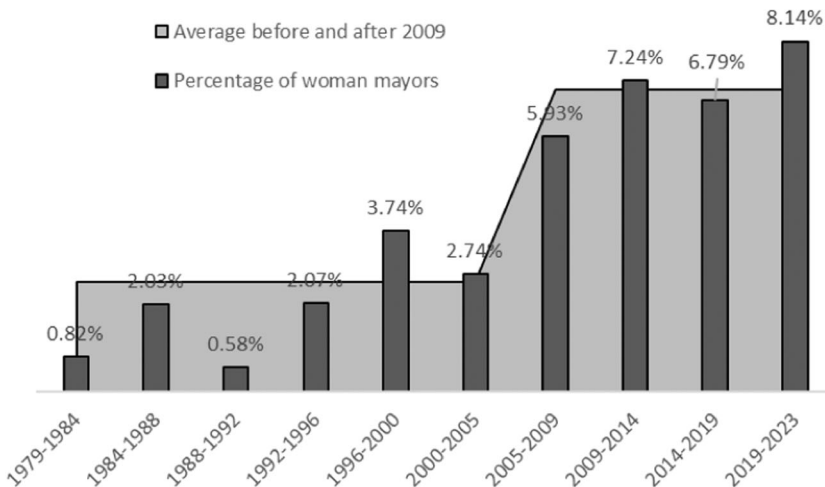

FIGURE 1 Percentage of women mayors in Ecuador, 1979–2019. *Source*: Authors' elaboration with data from Consejo Nacional Electoral (2022)

presence of women mayors is 8.14%, in the last electoral process (2019–2023). Figure 1, where we plot the percentage of female mayors for every electoral process, shows that starting in the 2005 elections, there is a marked improvement in the representation of women in comparison with the previous 25 years. The increasing tendency continues for the 2009 election. The average proportion of female mayors before 2009 is 2.23%, and after, 7.03%, an increase of more than 200%.

To measure the number of women being selected as candidates in uninominal elections, we construct the variable *Female Candidates$_{it}$* , which captures the percentage of women among the candidates running for mayor. Unfortunately, this information is available only for the past four electoral processes, so the original sample shrinks to 881 observations for regressions using this variable as a dependent variable. In Figure 2, we report the percentage of female candidates per election in our sample. In general, the presence of female candidates who run for mayor is small, varying from 10.10% to 12.21% in our sample period.

Our empirical tests are based on two econometric models. The first uses *Woman mayor$_{it}$* as a dependent variable, and the second uses *Female Candidates$_{it}$* . The first model is directly related to Hypotheses 1 and 2 and is designed to evaluate the effects of the quota or parity laws on the likelihood of electing a female mayor and the increase in role models as a possible causal chain. Due to the dichotomous nature of *Woman mayor$_{it}$*, the model is based on the following logistical regressions:

Model (1)

$$\Pr(Woman\ mayor_{it} = 1/X_{it}) = Logit\ (\alpha + \beta_1 Quota/Parity_t + \beta_2 Women$$

$$legislators_{it} + \beta_3 Urban_t$$

$$+\beta_4 Education\ rate_{it} + \beta_5 EAFP_{it} + \beta_6\ population_{it}).$$

The second model is related to Hypothesis 3 and uses *Female Candidates$_{it}$* as the dependent variable, to measure the effects of the changes in regulations on the proportion of female candidates. We use a linear regression model.

Model (2)

$$Female\ candidates_{it} = \alpha + \beta_1 Quota/Parity_t + \beta_2\ Women\ legislators_{it} + \beta_3 Urban_t +$$

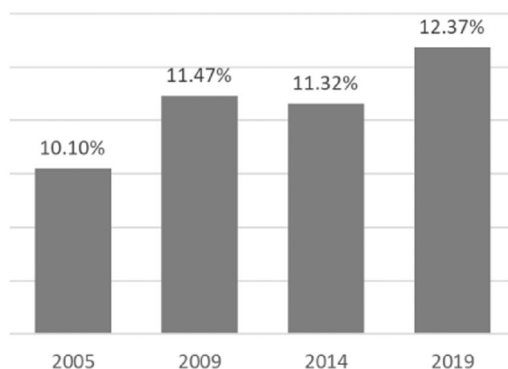$$\beta_4\ Education\ rate_{it} + \beta_5\ EAFP_{it} + \beta_6\ Population_{it} + \varepsilon_{it}.$$

FIGURE 2 Women candidates for Mayor in Ecuador, 2005–2019. *Source*: Authors' elaboration with data from Consejo Nacional Electoral (2022)

The explanatory variables for both models are the same and are defined below. To test if women's representation in the provincial legislature has influenced the likelihood of electing female mayors (H2), we use the variable *Women Provincial Legislators$_{it}$,* which represents the percentage of women elected as legislators for the province to which each canton belongs. Until 1998, legislators held provincial office for 2 years and national office for 4 years. From the legislative period ranging from 1998 to 2003, both positions lasted for 4 years. As we mentioned, our variable records the same percentage of women as provincial legislators for all cantons that are part of the same province. Figure 2 shows the percentage of women in the Ecuadorian unicameral legislature for our sample period. After 1998, there is a steady increase in the number of women deputies. Furthermore, with the Constitution of 2008, the presence of female provincial legislators is more important than in previous periods (see Figure 3).

To measure the spillover effect of institutional reforms on the increase of women mayors (H1), we focus on the institutional changes in the Ecuadorian electoral system that started with the approval of the new constitution in 1998. This constitution states that women must account for at least 20% of participation in the lists for plurinominal elections. To implement such changes, the Organic Law of Elections was reformed in the year 2000, mandating a minimum of 30% of female participation in the lists and an increase of 5% each electoral cycle until reaching parity. Yet, the organism in charge of elections (*Tribunal Supremo Electoral*) created additional regulations that did not completely allow for the fair implementation of the quotas for the 2000 and 2002 elections. These regulations were deemed unconstitutional in November 2002, but they were replaced by regulations in which the political parties were in charge of the implementation and control of the quotas.

The promulgation of the new constitution in 2008 is the critical event that marks a real intention to generate a change in the preferences of the voters. This constitution promoted parity directly since it mandated that, for subsequent plurinominal elections, the lists of candidates must be structured alternately between men and women or vice versa. In fact, the presence of women in the legislature, as Figure 2 shows, has grown considerably since the 2008 Constitution. Meanwhile, this effect is not observed in similar levels in the executive government, where the number of female ministers is still relatively small (Sotomayor Valarezo
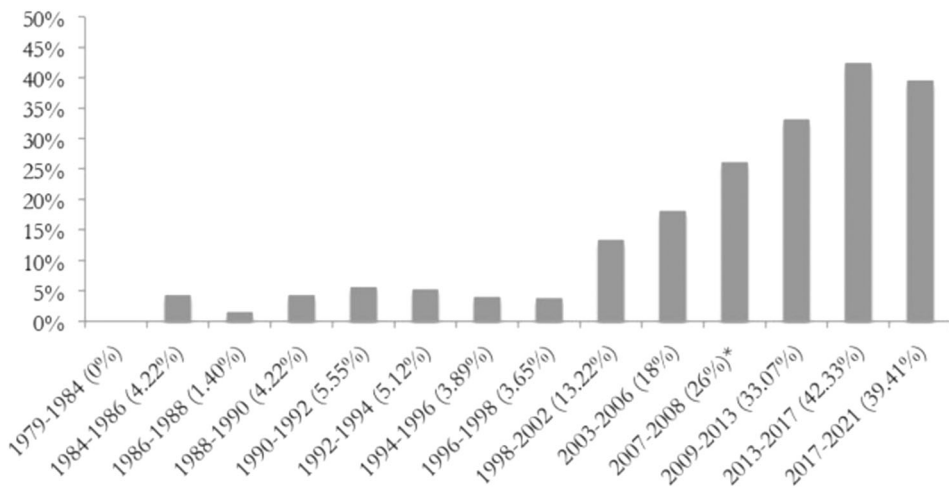

FIGURE 3 Women Provincial Legislators in Ecuador, 1979–2019. *Source*: Authors' elaboration with data from Basabe-Serrano and Alava Arteaga (2022). *The 2007–2008 period was originally 2007–2010, but in 2008, President Correa announced a constituent assembly and subsequently closed the legislative branch. The constituent deputies acted "as if" they were congress members during the policy-making process of a new constitution

& Huertas-Hernández, 2021). To capture these institutional changes, we use the dichotomous variable, $Quota/Parity_t$, which takes the value of 1 for the elections held after the implementation of the Constitution of 2008, and 0 for all previous elections. In our sample, there are seven electoral processes before 2008 (for mayoral periods starting in 1979, 1984, 1988, 1992, 1996, 2000, and 2005) and 3 after (2009, 2014, and 2019). Our selection of the year 2008 for our dummy variable $Quota/Parity_t$ is based on an empirical test that includes dummy variables for each of the 10 elections in our sample. Results (reported in our empirical section) show that the significant structural change happened after the 2009 election.

To identify if the sociodemographic composition of the canton in which the election takes place affects the election of female mayors, we construct the trichotomic variable $Urban_t$, which takes the value of 1 for urban cantons, 0 for rural cantons, and 0.5 for cantons in which the difference between urban and rural population is not considerable. Urban cantons are those in which 60% or more of the people are living in an urban area, and rural cantons are similarly defined as those in which 60% or more of the population lives in a rural area. In other cases, we consider that cantons are a hybrid between both categories. The information to construct this variable was obtained from the National Institute of Statistics and Census (Instituto Nacional de Estadística y Censos [INEC], 2022). In our sample, of the 1949 cantons observed, 66.80% are rural, 15.85% are urban, and 17.34% are in an intermediate position. Although the gap between rural and urban cantons has decreased over time, this difference remains significant. In 1979, for example, of the 122 existing cantons, 71.31% were rural; 14.75%, urban; and 13.93%, hybrid; and in 2019, of the 221 cantons, 59.72% are rural; 19.45% are urban; and 20.81% are in the intermediate status.

To assess whether the improvement in the population's education level favors the election of female mayors, we build the continuous variable $Education Rate_{it}$ that captures the academic enrollment rate reported for each canton I along the period t. Regarding the possible influence of an increasing number of women being incorporated into the labor market on the number of female mayors, we take as an empirical reference the data relating to the percentage of the female population that is economically active, represented by the variable $EAFP_{it}$. To measure the effect of population size on the likelihood of electing a female mayor, we use the information from the population and housing censuses carried out every 10 years in Ecuador. We build the continuous variable $Population_{it}$ that represents the population in canton I between the period t in millions of persons. Data for $Education Rate_{it}$, $EAFP_{it}$, and $Population_{it}$ come from Instituto Nacional de Estadística y Censos (INEC) (2022). Appendix A shows descriptive statistics for all the variables used in our empirical analysis.

DISCUSSION OF EMPIRICAL FINDINGS

In Table 1, we present estimation results for the parameters of our empirical Models 1 and 2. As explained in the previous section, Model 1 uses $Woman mayor_{it}$ as the dependent variable. We present estimation results for Model 1 using logistical regressions with robust standard errors, as well as a penalized logistical regression (Firth, 1993; Heinze & Schemper, 2002)[11] that controls biases that could produce rare events. The dependent variable $Woman mayor_{it}$ may be considered a rare event variable since only 3.5% of the observations are female mayors, and as Figure 1 shows, women mayors did not exceed 10% in any election in our sample period (1979–2019).[12] The sample size for Model 1 includes the complete 1941 observations. The Model 2 dependent variable is $Female Candidates_{it}$, and we report linear regression results (OLS) with robust standard errors. The Model 2 sample size includes only 811 observations since the dependent variable is only available as of 2005. We report estimated coefficients and the corresponding z statistics in parenthesis below. The symbols *, **, and *** represent statistical significance at 10%, 5%, and 1% levels, respectively.

TABLE 1 The effects of quota or parity rules in Ecuador

Variables	Model 1 Logit	Model 1 rare event Logit	Model 2 OLS
Quota or parity	1.08***	1.07***	3.28**
	(2.83)	(3.02)	(2.64)
Women provincial legislators	0.01*	0.01**	0.04*
	(1.93)	(1.96)	(1.67)
Urban	0.69*	0.69*	7.17***
	(1.89)	(1.93)	(4.55)
Education rate	−0.09	−0.09	−1.04**
	(−0.80)	(−0.85)	(−2.05)
Economically active female population	−0.01	−0.01	−0.10**
	(−1.27)	(−1.33)	(−2.38)
Population	0.45	0.52	1.38
	(1.08)	(1.33)	(1.03)
Trend			
Constant	−3.03***	−3.00***	16.93***
	(−5.52)	(−5.32)	(5.48)
Observations	1941	1941	811
R2 (Pseudo 1 and 2)	0.0522		0.05

*, **, *** represent significance at 10%, 5%, and 1% levels.

Source: Authors' elaboration.

Results for Model 1, using Logit and Rare Event Logit, show that the variable *Parity* has a positive, statistically significant effect, which implies that the existence of a quota or parity law has a substantial influence on the probability of more female mayors being elected. Thus, we verify our main hypotheses (H1) and conclude that a change in the institutional design aimed at stimulating the participation of women in plurinominal elections generates a positive externality over female representation in uninominal elections, measured by a larger number of women elected as mayors (see Table 1).

We also confirm that an increased representation of women in the provincial legislature, measured by the variable *Women Provincial Legislators*, also positively affects the probability of electing a female mayor, confirming our third hypothesis (H3). Notice that the introduction of the parity law in 2008 also affected the number of elected female legislators (*Women Legislators*), suggesting that these two variables are possibly correlated. Our results for Model 1 show that both variables (*Parity* and *Women Legislators*) are simultaneously significant. These results reinforce the evidence in favor of hypothesis 1 and allow for greater certainty about the causal links of the institutional changes. We confirm that the increased number of female provincial legislators influences the representation of females as mayors, but an additional spillover effect captured by the variable *Parity* is also significant.[13]

These empirical findings show that the effects of the "rules of the game," the parity or quota laws in this case, are important for the representation of women not only in the legislature but also in other areas of government. Our results reinforce the idea that institutions matter, since

rules aimed at benefiting women's participation in plurinominal elections have beneficial, albeit indirect, effects on uninominal elections.

Although with less statistical significance in Model 1, the fact that a canton is urban ($Urban_{it}$) also positively influences the election of female mayors. This empirical finding is in line with the theory of modernization regarding the greater progressivity in value terms of geographical areas with greater access to certain goods or services. On the other hand, the educational background of the population (*Education Rate*), the female presence in the labor market (*PFEA*), and the population of cantons (*Population*) are not statistically significant. Interestingly, the variables *Education Rate* and *PFEA* have a negative coefficient in our regressions.

These results are similar to those reported in studies about Latin American women in ministerial cabinets and could be explained by the structural asymmetries of the labor market (Escobar-Lemmon & Taylor-Robinson, 2005; Gasparini & Tornarolli, 2009). These researchers point out that if women's education increases or they are more productive at work, they have fewer opportunities to stand for elections and take office.[14] Specifically, given the existing market distortions that exacerbate gender exclusion, an improvement in women's education levels does not necessarily imply an increase in their job opportunities. Thus, structural problems reduce the effect of women's efforts to reduce gender asymmetries.

Results for Model 2 are very similar to those described for Model 1. The 2008 parity law positively influences the number of women candidates, confirming H2 and the externality effect. Moreover, we find evidence that the possible explanation for the externality effect is the increase in the proportion of female candidates running for the election which may be caused by an increase in the political power of women in their political party. It is also evidenced by a positive but marginally significant coefficient for the variable *Women Legislators*. The effects of $Urban_t$ are strongly significant, showing that the theory of modernization is relevant to the proportion of female candidates in a geographical area. The effects of *Education Rate* and *EAFP* are significant and negative, confirming the results in the previous literature, as described above.

Next, we focus on evaluating the magnitude of the effects of each variable included in our empirical models. In the first column of Table 2, we report the marginal effects for our logit Model 1 evaluated at the mean of each independent variable. The reported results can be interpreted as the effect of an infinitesimal increase in the explanatory variable on the probability of electing a female mayor for an average canton. Our results show that the largest effect corresponds to the variable measuring the introduction of the parity law of 2008. According to our model, the introduction of parity laws for plurinominal elections increased the probability of electing a female mayor by 3.72% for an average canton. Since the unconditional probability of a woman being elected mayor in our sample is 4.36%, an increase of 3.72% implies that the probability of electing a woman mayor almost doubled in an average canton after the 2008 changes[15] (see Table 2).

Although with less statistical significance, the increase in female provincial legislators and the fact that the election takes place in an urban population also positively affect the likelihood of electing female mayors. We find that a 1% increase in the percentage of female provincial legislators increases the possibility of electing a female mayor by 0.04%. Urban cantons have on average 2.36% more probability of electing female mayors. The population's level of formal education, the presence of women in the economically active population, and the population of the canton have no significant effect. Our results in the first column of Table 2 focus only on an average canton. To understand better the effects of the new legislation of 2008 in different types of cantons, we computed marginal effects for urban and nonurban cantons. The results reported in the second and third columns of Table 2 show that the introduction of the parity law had a larger effect in urban jurisdictions, with a 5.96% increase in the probability of electing a female mayor, compared with a 3.18% for a nonurban canton.

TABLE 2 Marginal effects for changes quota or parity rules in Ecuador

Variables	At the mean	Urban=1	Urban=0
Quota or parity	0.0372***	0.0596**	0.0318***
	(2.9510)	(2.2261)	(2.9835)
Women provincial legislators	0.0004*	0.0007*	0.0004*
	(1.9086)	(1.8263)	(1.8462)
Urban	0.0236*	0.0379	0.0202**
	(1.8774)	(1.2973)	(2.2168)
Education rate	−0.0031	−0.0049	−0.0026
	(−0.7970)	(−0.7124)	(−0.8264)
Economically active female population	−0.0005	−0.0008	−0.0004
	(−1.2997)	(−1.3290)	(−1.2612)
Population	0.0156	0.0249	0.0133
	(1.0739)	(1.0656)	(1.0600)
Observations	1941	1941	1941

*, **, *** represent significance at 10%, 5%, and 1% levels.
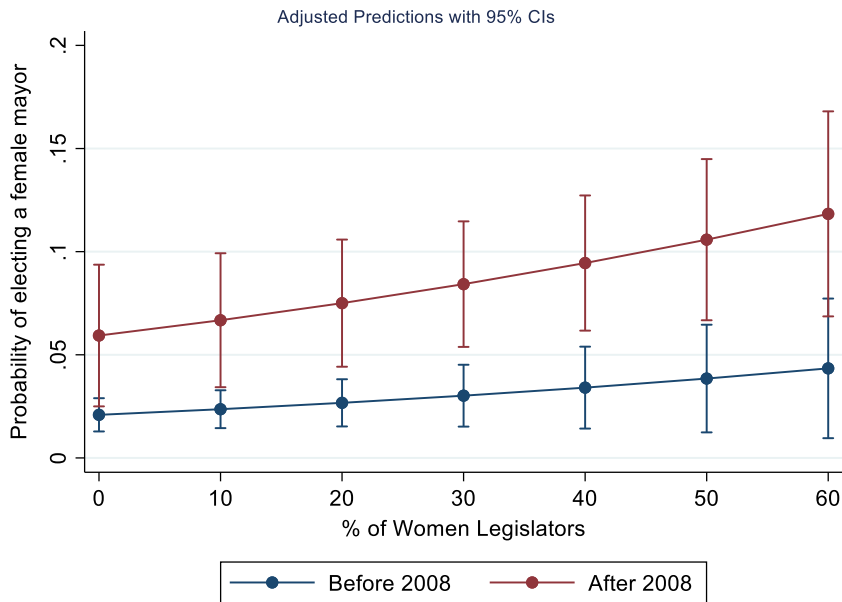*Source*: Authors' elaboration.

FIGURE 4 Predicted probabilities of electing women mayors. *Source:* Authors' elaboration

Similar analyses can be performed to evaluate the effects of the quota or parity law based on the percentage of female provincial legislators. In Figure 4, we report predicted probabilities for our logit Model 1, assuming different percentages of female provincial legislators. The blue line shows the predicted probability of electing a female mayor before the quota or parity law,

while the red line demonstrates the predicted probability after the introduction of this institutional arrangement. As our model predicts, as the percentage of female provincial legislators increases, the probability of electing female mayors also increases (H3). The effect is not linear but represents a growing trend; the higher the percentage of female provincial legislators, the greater the influence on the probability of electing female mayors. For example, after 2008, an increase in female provincial legislators, from 0% to 10% of the legislative body, means an increase of less than 0.75% (from 5.93% to 6.67%) in the probability of electing female mayors. Yet, a rise from 50% to 60% of female provincial legislators leads to an increase of almost 1.25% (from 10.58% to 11.83%) in the probability of electing female mayors.

In Figure 4 we can also evaluate the effect of the quota or parity law, represented by the distance between red and blue lines. As we report in Table 2, for an average canton with 14% of provincial legislators being female, there is a 3.72% increase in the probability of electing a female mayor. Still, there is a more significant effect in cantons where there is a higher percentage of female provincial legislators; for cantons with 60% female provincial legislators, the probability can increase up to 7.49%. We can perform a similar analysis to evaluate to what extent the fact that the canton is in a rural or urban area can affect the presence of female mayors (H4).

Finally, we focus on the interpretation of the results of our linear regression for Model 2, reported in the third column of Table 1. The coefficients of this linear model can be directly interpreted as marginal effects on the dependent variable, the percentage of female candidates. Thus, the implementation of the quota or parity law increased the percentage of female candidates running for mayor by 3.28%. The magnitude of this influence is very significant since the average percentage of female candidates is only 11.32%. The largest effect on the percentage of female candidates is driven by the variable $Urban_{it}$, since urban cantons have 7.17% more female candidates. *Education Rate* and *EAFP* have a smaller and only marginally significant effect.

In summary, the implementation of the quota or parity laws not only improved the descriptive representation of women in the Ecuadorian legislature but also indirectly generated positive effects on the number of female mayors and on the number of female candidates running for mayor. In other words, an institutional arrangement aimed at increasing the number of women running in plurinominal elections produced a positive externality over uninominal elections. In terms of causal mechanisms, the analyzed findings allow us to argue that the rise in female legislators at the provincial level affects the will of the voters at the regional (canton) level. Also, we have some suggestive evidence showing an increase in the proportion of women selected as candidates after the quota or parity reforms. These effects would be materialized in an increase in votes for women mayors.

Robustness test

Our main results are based on the dichotomous variable $Quota/Parity_t$ that takes the value of 1 for the elections held after the Constitution of 2008, and 0 for all previous elections (2009, 2014, and 2019). As explained above, the quota-related institutional changes in Ecuador started with the 1998 Constitution, so it is possible that it had effects on the 2000 and 2005 elections. To account for this effect, we create nine dummy variables, to control for the relevant 10 electoral process in our sample: *Elec_1978, Elec_1984, Elec_1988, Elec_1992, Elec_2000, Elec_2005, Elec_2009, Elec_2014*, and *Elec_2019*. Our base case will be the 1996 elections, where all other dummies are equal to 0, and thus the coefficients on the dummies can be interpreted as an increase in the probability of electing a female mayor since the 1996 elections.

Results reported in Table 3 show that the significant changes start in the 2009 elections, confirming the selection of our $Parity_t$ variable. In unreported experiments, we estimate our

TABLE 3 Robustness test

Variables	Model 1 Logit	Model 1 Rare Event Logit
Elec_1978	−1.72	−1.38
	(−1.58)	(−1.51)
Elec_1984	−0.65	−0.56
	(−0.93)	(−0.85)
Elec_1988	−1.74	−1.40
	(−1.63)	(−1.56)
Elec_1992	−0.79	−0.70
	(−1.14)	(−1.07)
Elec_2000	−0.12	−0.11
	(−0.21)	(−0.19)
Elec_2005	0.65	0.62
	(1.27)	(1.30)
Elec_2009	1.24**	1.20**
	(2.20)	(2.26)
Elec_2014	1.04*	1.00*
	(1.71)	(1.77)
Elec_2019	1.24**	1.19**
	(2.00)	(2.16)
Women provincial legislators	0.01	0.01
	(1.02)	(1.08)
Urban	0.81**	0.81**
	(2.22)	(2.27)
Education rate	−0.16	−0.17
	(−1.32)	(−1.46)
EAFP	−0.02*	−0.02*
	(−1.69)	(−1.72)
EAFP	0.61	0.67*
	(1.45)	(1.70)
Population	−2.24***	−2.18***
	(−3.22)	(−3.18)
Observations	1941	1941
Pseudo R^2	0.0756	

Note: Robust z statistics in parentheses. Abbreviation: EAFP, economically active female population.

***$p < .01$.; **$p < .05$.; *$p < .1$.

Source: Authors' elaboration.

Model 1 using the 2005 elections for the construction of the *Quota/Parity_t* dummy, and our results related to the spillover effects are robust to such change.

CONCLUSIONS AND THEORETICAL IMPLICATIONS

In this article, we analyze and test empirically the indirect and positive effect quota or parity laws in plurinominal elections—such as legislative elections—have on uninominal elections—such as mayoral elections. We find evidence that quota or parity laws create spillover effects that significantly improve the probabilities of women being elected as mayors. In accordance with the new institutionalism and feminism theories, we find that when the "rules of the game" are structured to improve the representation of women in plurinominal elections, it can generate indirect positive effects on other public decision-making arenas, such as uninominal elections. Thus, the benefits of institutional reforms should not only be assessed in the political arenas to which they are clearly oriented but should also be analyzed in a broader context.

Yet, this increase in the number of elected mayors and legislators is not observed in the ministerial cabinets, where the number of female ministers is still relatively small (Sotomayor Valarezo & Huertas-Hernández, 2021). Studying the possible reasons behind this relative absence of women in other political decision-making arenas would be a valuable future research agenda.

One of the main challenges of electoral systems is to increase female representation in uninominal elections such as mayoral ones since reforms via quota or parity laws are difficult to apply. Our results show that a valid solution is the increase of female role models, which can be achieved through the implementation of quotas or parity legislation at the level of plurinominal elections. Our findings show that such policies have some effect, but also that female representation in Ecuador at legislative and mayor levels is still very poor.

More effective and innovative reforms should be implemented, dealing with structural changes in the understanding of the roles of women and men in the public sphere. As evidenced by Atkeson (2003), the simple presence of female candidates is not enough to increase political engagement, but the presence of competitive female candidates is a key factor to increasing women's political involvement and interest. Thus, reforms should include public and private financing of programs that promote female political participation and competitiveness (Muñoz-Pogossian & Freidenberg, 2020). Examples of possible reforms include publicly funded women's leadership training programs, such as those implemented in Panama, Mexico, Costa Rica, Colombia, Brazil, and Honduras; special campaign financing for women, such as Brazil's free airtime specifically for female candidates; or financial incentives for political parties that get women elected, as in Chile and Costa Rica.

Future research agendas should not only include descriptive aspects of female representation in different political decision-making arenas but should also focus on more substantive aspects that evaluate the performance of elected women. In the case of mayors, there is much left to learn regarding what they propose and accomplish in their municipalities. Given that mayors are the heads of sectional governments, their performance will have a critical influence, not only on the number of elected officers but also on female representation in society.

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ENDNOTES

[1] We use mayor or female mayor for the person who is the chief of municipal governments. In some countries, this officer is called the governor.

[2] The institutional design to improve women's participation is focused on plurinominal elections, such as legislative elections. Mayors are elected in uninominal elections.

[3] The lack of research on female mayors does not exist only in Latin America. In Europe, research about politics and gender in subnational perspective is also minimal (Navarro & Sanz, 2018; Sundström & Stockemer, 2015).

[4] Other studies that analyze the effects of the presence of women in political decision-making arenas are Gilardi and Dlabac (2019) on Switzerland; Bhalotra et al. (2018) on India; Geys and Sørensen (2019) on Norway; and Ferreira and Gyourko (2014) on the United States.

[5] Whether the contrasting findings may be driven by differences in countries studied or in methodologies used is an empirical question. Clayton (2015) argues that the apparent counterintuitive results about negative spillover effects of quotas may be explained by the fact that quotas are seen as giving preferential treatment to the minority group at the expense of majority members, which can create a stigma surrounding the beneficiaries of the affirmative action measures.

[6] Consistent with this view, the existing literature has shown that women's political attitudes and behavior are shaped by the gender of their representatives (Fox & Lawless, 2004; Lawless & Fox, 2010). This finding is also related to Gilardi's (2015) study on the effects of role models on improving women's representation.

[7] The number of women in political parties has increased in the last decades, although not to the degree expected (Folke & Rickne, 2016; O'Brien, 2015).

[8] Until the early 1990s, the election of mayors was limited to the province capitals and to a few cities that, without having this status, were assumed as such due to their population size (e.g., Milagro or Quevedo). In the rest of the cities, "presidents of the municipal councils" with the same powers as mayors were elected. Since the mid-1990s, all the actors that preside over municipalities are called mayors.

[9] The political-administrative division in Ecuador includes provinces, cantons, and parishes. A province has cantons, and cantons have parishes. For provinces, the executive power is in the *prefectos provinciales*, and for cantons it is in mayors.

[10] Municipal elections in Ecuador took place in 1979–1984, 1984–1988, 1988–1992, 1992–1996, 1996–2000, 2000–2005, 2005–2009, 2009–2014, 2014–2019, and 2019–2023.

[11] In the case of logistic regression, penalized likelihood is also useful in that it produces finite, consistent estimates of regression parameters when there are no maximum likelihood estimates because of complete or quasicomplete separation.

[12] Although the presence of mayors is minimal in most Latin American countries, Ecuador is one of the most striking cases. Colombia follows a similar pattern; during the last electoral process between 8% and 10% of appointed mayors were women (Batlle, 2018).

[13] In nonreported regressions, we include interaction terms between the variables *Parity* and *Women legislators*, and we did not find significant results. This finding reflects an independent effect of each of the variables on the likelihood of electing female mayors.

[14] We recognize that this literature is not directly comparable, since it focuses on female individual characteristics, whereas our data reflects the education at the canton level. We argue only that the driving forces behind these results may be the same. Although running for office is not a typical job, market distortions that exacerbate gender exclusion will affect not only regular labor markets but also political parties and other institutions.

[15] We also estimate the model without the variable Women Provincial Legislators, to evaluate possible collinear effects with our Quota-Parity variable. The marginal effects of Quota-Parity increase to 5% in this case. Thus, the results reported in the text can be considered the most conservative.

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APPENDIX A: DESCRIPTIVE STATISTICS

Variable	N	Med	Stand deviation	Minimum	Maximum
Education	1942	6.52	1.76	0.95	12.37
Economically active female population	1942	28.34	13.49	0.64	63.74
Women provincial legislators	1949	14.10	19.81	0.00	75.00
Population	1948	0.06	0.19	0.00	2.35
Female candidates	881	11.32	13.66	0.00	75.00

Discrete variable

Urban		
Values	Frequency	%
0	1302	66.8
0.5	338	17.34
1	309	15.85
Total	1949	100

Source: Authors' elaboration.