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Raising the Bar: The Impact of Gender Quotas on Legislator Quality

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Abstract

We analyze the effect of a legislative candidate quota on the quality of congresspeople elected. We study a landmark legislation passed in 2014 in Mexico that required all parties to have an equal number of male and female congressional candidates. We observe a 31% increase in number of bills proposed in legislative sessions after the quota and a significantly higher likelihood for greater educational attainment among male and female deputies alike, controlling for an array of factors that could influence our quality measures. Since not all states had the same level of female representation when the quota was introduced, we identify how the quota impacted quality between high-treatment and low-treatment states. We find that the gender quota increased the number of high-quality female congresswomen the most in states that were farther from reaching the 50-50 ratio, leading us to believe that there was a cultural change caused by the implementation of gender quotas that explains the rise in bills proposed and published among deputies.

I. Introduction

In 1995, at the World Conference on Women, the United Nations urged countries to increase the representation of women in their governments. Since then, gender quotas have been implemented in over 130 countries worldwide as a popular mechanism to address this issue (Dahlerup et al. 2013). The push towards female representation stems from the argument that males and females have different experiences and therefore different, sometimes conflicting, interests. Given that half of the population of most countries is female, and the legislative branch is meant to represent the interests of the people, its gender composition should be at least close to that observed in the population.

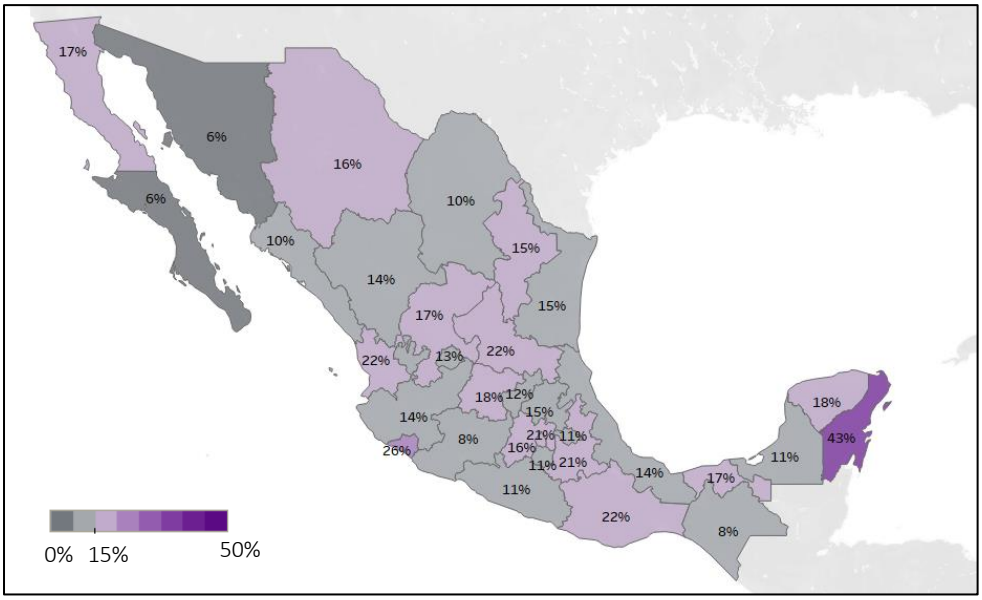
The application of quotas in economics is understood as imposing an "artificial" demand for a particular commodity that may not exist, but should, in a free market. With respect to gender quotas, economic theory would suggest that if the demand for female representatives exceeds the supply of eligible female candidates, political parties could resort to selecting from a pool of women who may not have been considered otherwise, potentially leading to a decline in the quality of elected officials. However, if the quota successfully meets its purpose, then it can correct for biases that prevent the natural occurrence of female candidates and in turn increase representation without altering the overall quality of elected officials.

In this paper, we use Mexico as a case study to explore the effects that mandated female representation has had on the quality of elected legislators. This is a critical country to study for two main reasons. First, Mexico has observed a dramatic increase in their male-female ratio in congress over the past two decades. Second, Mexico passed a landmark gender parity law in 2014 that has received international recognition. This law

was so extensive in its application, though, that it makes it difficult to study. While most economic papers on the impact of gender quotas leverages a treatment-control reality, Mexico's 2014 gender quota law left no control group because all states were mandated to adhere to a 50-50 candidate quota in congress, all at once, for all types of candidates, and in both chambers. In this paper we use a novel approach for assessing the impact of gender quotas in congress that resolves some of the identification problems observed in the Mexican context.

We rely on bills proposed and published, which we refer to as legislative productivity, and educational attainment as proxies for quality. The empirical strategy implements logit models and multivariate OLS regressions to evaluate the relationship between the 2014 quota and legislator quality. In order to isolate the confounding factors impacting quality, we take the differences in outcomes across three dimensions: pre/post policy, quality, and treatment size. We recognize that even though the 2014 quota was at a national level, some states were farther from having equal number of male and female candidates in federal elections than others. Essentially, states that were farther away from reaching the 50-50 quota received a higher treatment than those that were closer to it. By classifying all states between high and low treatment we can observe with more clarity the impact that the 2014 gender quota law had on elected legislators. Figure 1 displays said discrepancy. States below the national median of 15% female candidates pre quota are high-treatment states and those above are considered low-treatment.

Figure 1: 24-Year Average of Female Federal Deputies from All States Pre-Quota (1988-2012)[1]

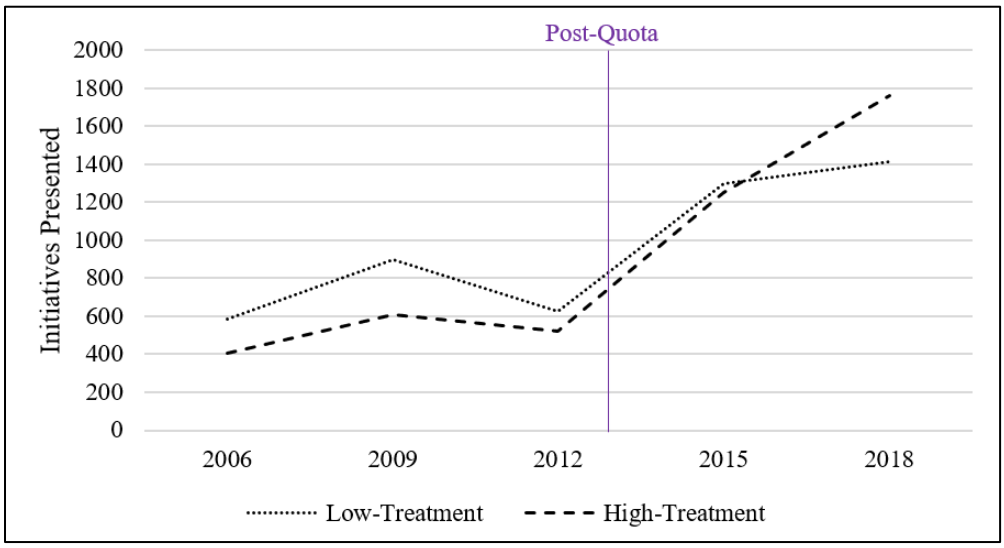


Our triple-diff estimator suggests that the gender quota resulted in a larger increase of high-quality females from high-treatment states compared to low-treatment states. Our results are different than what traditional quota models would predict. They show that rather than there existing a fixed supply curve of eligible female legislators, the impact of the gender quota in high-treatment state is incentivizing higher-quality females to take on political careers. We attribute this change to a cultural shift whereby network effects compound the quality effect in high-treatment states. Additionally, we observe that quality, as measured through legislative productivity and education, increases across genders after the 2014 quota. Figure 2 illustrates how the quality of deputies from high-treatment states, measured in bills presented, surpassed that of low-treatment states, a hike that, as expressed above, was mainly driven by the increase in high-quality females.

[1] Developed by the researcher using data from the National Electoral Institute (INE)

In Mexico, the first step towards publishing a bill is presenting what is called an initiative. Published initiatives are those that become laws. To use the language of the country, we refer to bills as initiatives.

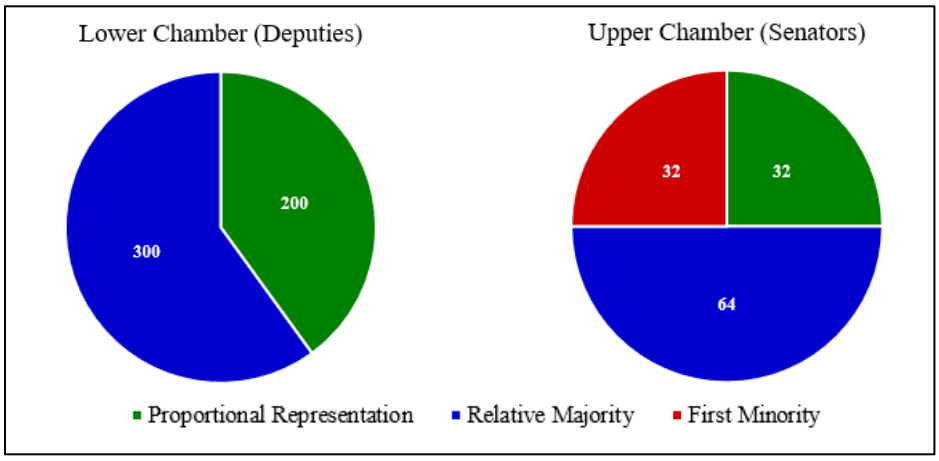
Figure 2: Initiatives Presented by Deputies from Low and High-Treatment States



II. Background

Mexico has a bicameral congress that uses a mixed electoral system; the lower chamber is composed of 500 deputies, 200 of whom are elected through proportional representation while the remaining 300 are elected through single-district relative majority, also referred to as plurality. The upper chamber is comprised of 128 senators, two from each of the 32 states are elected through relative majority, another 32 are assigned to the primary candidate of the party who received the second-highest vote number (first minority), and the remaining 32 are elected through proportional representation. Each congressperson has a substitute in case they step down. Deputies serve three-year terms, while senators serve six-year terms. Prior to 2014, immediate reelection was prohibited for all congresspersons. However, under the current rules, deputies can serve for up to four consecutive terms, and senators can serve for up to two. Figure 3 summarized Mexico's legislative branch and electoral system.

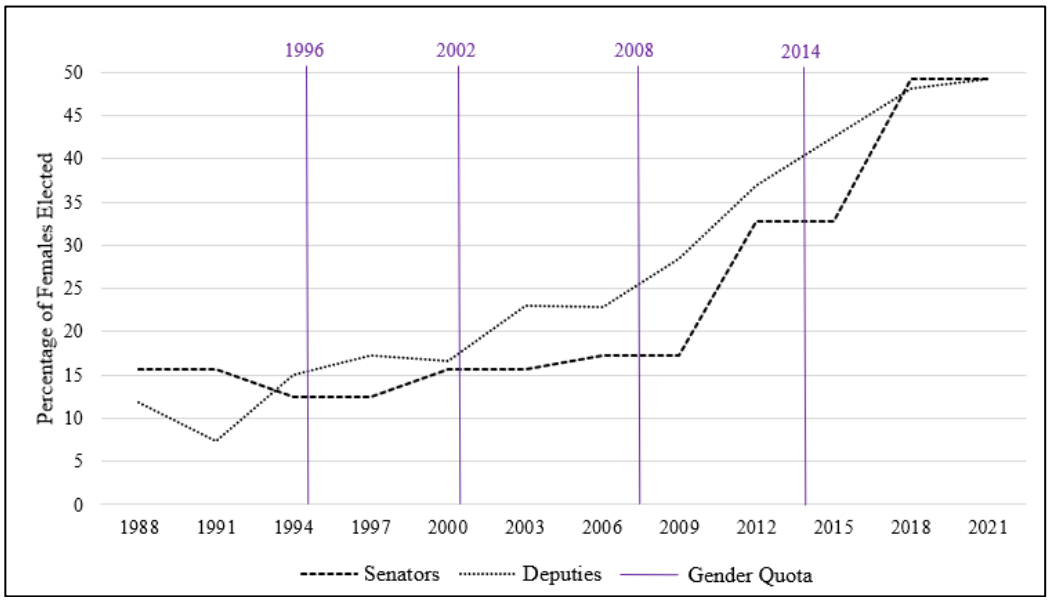
Figure 3: Composition of Mexican Congress by Election Type



In the past two decades, Mexico has made significant progress in increasing the representation of women congress, largely due to the implementation of candidate quotas. As shown in the figure 4, the percentage of female lawmakers in Mexico has been

steadily increasing. This has earned Mexico international recognition and has positioned it as a model for countries seeking to improve gender parity in their legislative bodies (Brookings). When it comes to the percentage of females serving in parliament, Mexico is currently ranked third in the world, along with New Zealand and the United Arab Emirates in terms of the percentage of females serving in parliament (IDEA n.d.). The success of Mexico's gender parity initiatives can be attributed to multiple revisions of its gender quota laws, highlighted in figure 4. The 2014 law mandates that political parties nominate an equal number of male and female candidates and is considered to be the strictest and most impactful of these gender quota law iteration (Gilas and Méndez Pacheco 2018).

Figure 4: Percentage of Females Elected to the Mexican Congress



The most popular gender quota law requires political parties to achieve a certain gender ratio in their candidate list, this is known as a "Legislated Candidate Quota" (IDEA 2023). Well-implemented gender quotas have proven to be an efficient and rapid

solution to increasing female representation in government. In fact, the percentage of women in parliaments worldwide increased from 13% in 1998 to 21% in 2013, largely due to the implementation of gender quota laws (Dahlerup et al. 2013). Despite this, gender quotas have also faced some resistance, with some arguing that they violate the basic principles of a liberal democracy, and others saying that they advance democratization efforts. While this question is beyond the scope of this study, it is important to note that the controversy surrounding gender quotas in government has prompted political scientists and economists to investigate the topic further.

Gender quotas can take different forms, including voluntary party quotas and legislated quotas. Voluntary party quotas apply to candidates or elected officials, and are not legally binding, but instead rely on the willingness of political parties to set and meet their own candidate and elected official gender targets. Legislated quotas, on the other hand, are backed by law and require political parties to adhere to a certain gender ratio in their candidate lists or in elected positions. The specific design of gender quotas also varies depending on the electoral system of each country. Gender quotas are most common in legislatures with proportional representation as an electoral method since they are easier to implement (IDEA 2023). Quotas can be applied at the federal, regional, or local levels. Mexico's 2014 gender parity candidate quota applies to all state legislatures as well as congress (Ley General de Instituciones y Procedimientos Electorales 2014).

Mexico's experience with gender quotas can be distilled into six main policy changes. The first attempt to enforce gender quotas in 1996 limited political parties to no more than 70% of candidates from the same gender. However, since there were no penalties for noncompliance, this quota had little effect on female representation. It was not until 2002,

the National Electoral Institute (INE) began enforcing the 30-70 quota, applying sanctions to non-complying parties. This iteration of the quota, however, only applied to proportional representation seats and to elected candidates, not their substitutes. In 2008, the quota was raised to 40-60, and while parties technically adhered to it in the 2009 election, 11 female candidates resigned on the first day of session, all of whom had male substitutes. This was coined as the "Juanitas" phenomenon, and led to a movement towards enforcing same-gender candidates and substitutes (Gilas and Méndez Pacheco 2018). In 2011, the quota was successfully amended, but several loopholes remained. In 2014, a more comprehensive gender quota law was introduced which required 50-50 gender parity at the constitutional level. The updated law mandated gender quotas for all seat types, prohibited parties from assigning previously lost districts exclusively to one gender, required proportional representation candidate lists to alternate genders (known as the "zipper quota"), and mandated that parties allocate at least 3% of their budgets towards female leadership development efforts. Given the strength of this law, our study focuses on the 2014 legislation given that it was the most robust policy in Mexico's gender quota history (Gilas and Méndez Pacheco 2018).

III. Literature Review

There are four areas in the literature that are critical to understanding the design and contributions of this research paper: first, the efficacy of gender quotas in improving representation; second, the issues that gender quotas aim to address; third, previous methods employed for measuring the quality of elected officials; fourth, the existing body of work on this subject matter withing the context of Mexico.

Whether or not the rise of female representation in parliament was caused by the implementation of gender quotas is a matter of continued debate given the number of factors that play a role in the efficacy of quotas, such as the details of quota policies and the political system where they are adopted. Recent work has explored how legal wording, quota requirements, sanctions for noncompliance, and perceived legitimacy influence the number of females elected into office (Krook 2009, 39). Researchers have implemented Ordinary Least Squares (OLS) regression analysis on cross-national data to establish that gender quota law size increases the percentage of females in the legislature (Schwindt-Bayer 2011).

Gender quotas in politics have also been applied to other government positions. For instance, gender quotas in city councils and party leadership are also used to accelerate the representation of women in these roles. The strategy to identify such a relationship includes OLS and instrumental variable estimates and logistic regression analyses with a difference-in-difference specification (Braga and Scervini 2017; O'Brien and Rickne 2016).

Other research regarding the efficacy of gender quotas consider the type of electoral framework in which they are applied. Countries that have adopted gender quotas in their

legislature have differing electoral processes such as proportional representation, plurality/majority, or mixed. It is widely agreed that closed-list proportional representation allows for the easiest implementation and efficacy of gender quotas in parliaments (Sacchet 2008; Dahlerup et al. 2013, 23). Multi-member district elections reduce barriers for females since they attenuate the advantages that incumbents, who are more likely to be male, enjoy while also incentivizing parties to support well-qualified females unfamiliar to voters.

Some arguments for higher female representation in politics stem from the idea that the types of policies emphasized by male and female lawmakers are markedly different. The concept of "critical mass" has reached the gender quota debate, suggesting that female-friendly policies are significantly more prevalent once some threshold of female representation has been reached. Of course, there are issues with the idea of females representing females since they are not one unanimous group and should not be expected to act as one. Evidence does suggest, however, that as the share of female representative rises, so do congressional debates surrounding women's rights and household dynamics (Grey 2006). Grey develops a joint-effect model using longitudinal textual analysis of New Zealand parliamentary debates to draw her conclusions. A different study focused on Italy found that gender quotas significantly increase the efficacy of policies regarding women and households (Braga and Scervini 2017). Braga and Scervini measured efficacy by using the fertility rate as a proxy for citizen satisfaction, which within the Italian context, even a small change can be very meaningful to the municipalities' future.

Even though there is no consensus on how to measure quality, researchers have used different proxies to estimate the impact of gender quotas on the quality of

politicians. Some studies have shown that artificially increasing the number of female candidates leads to a decline in the quality of elected officials (Murray 2010). However, more evidence suggests that the opposite is true, asserting that gender quotas improve quality by replacing male candidates who have been elected solely because of gender bias.

Empirical studies have relied mostly on Difference-in-Discontinuities and Difference-in Difference designs to evaluate gender quota impact on the quality of politicians. Researchers differ substantially in how they measure quality, but some common strategies include years of schooling, income prior to running for office, political experience, legislative efforts, and age (Braga and Scervini 2017; Besley et al. 2017; Allen, Cutts, and Campbell 2016; Weeks and Baldez 2015). Age is sometimes used as an indicator for experience (Borchert and Jurgen Zeiss 2003). Evidence from French municipal elections shows that gender quotas do not have a significant effect on the background, age, and political experience of municipal councils. In this case, gender quotas neither improve nor worsen politician quality (Lassebie, n.d.). The British general election of 1997 also did not find significant difference in politician quality among those elected through gender quotas (Allen, Cutts, and Campbell 2016). These researchers assessed quality by using age, previous occupation, educational attainment, and previous political experience as proxies.

The following studies support the theory that gender quotas don't just improve representation without hindering quality, but also have a positive effect on the competency of elected officials. A study modeling Swedish elections following a zipper quota predicts that female competency stays constant, however, male competence

increases significantly post quota (Besley et al. 2017). A different model observing high-skilled and low-skilled candidates finds that high-skill women candidates drive down low-skill male and female candidates (Júlio and Tavares 2017). Empirical studies of Italian local elections support this model. When assessing politician quality with years of education, gender quotas are found to be associated with a significant increase in the number of years of schooling of elected officials (Baltrunaite et al. 2014).

Given that Mexico has recently been championed for its rapid increase of female representation in government, there has been substantial interest in the impact that gender quotas have had on the country. Research has found that gender quotas have had a significant effect on the rise of female parliamentarians mainly due to the strict punishment for non-complying parties (Baldez 2004; Gilas and Méndez Pacheco 2018). Research on the 2009 election evaluates the mechanism for which the three major national parties, PRI, PAN, and PRD, met the quota laws of the time. Researchers found that about 70% of the female candidates were competing in districts previously lost by their parties (Aparicio-Castillo 2011). They find strong evidence that although the parties were meeting the quota laws in theory, they were undermining the spirit of the law to effectively increase female representation. This loophole was later addressed in the gender quota law amendment of 2014.

Despite there being multiple reports on the effectiveness of Mexico's gender quotas, there is little research assessing the impact of gender quotas on the quality of congresspeople elected, particularly after 2014. One paper analyzes the impact of democratization and gender quotas in Mexico on the quality of 500 senators from 1964-2012. The researchers assess candidate quality using educational attainment and political

experience. Their study finds that after compulsory gender quotas were implemented in 2006, women were more likely than men to have served as state deputies, but they were less likely to have mayoral experience (Beer and Camp 2016).

This study attempts to extend Beer and Camp's research question of the impact that gender quotas has had on the quality of congresspeople in Mexico but shifts focus to the 2014 gender quota law and leverages a much larger sample of deputies and senators. We leverage the existing literature by using bills proposed and educational attainment as adequate proxies for legislator quality while adding to the literature in three key areas: First, we produce a robust database with more than 3000 observations of Mexican federal legislators. Second, we preform econometric analyses to explore the relationship between the 2014 gender quota law and legislator quality. Third, our triple-diff method reveals how one can explore this relationship in settings that don't have an obvious treatment and control group.

IV. Data

To preform our econometric analyses, we built a database with the name of every legislator of the Mexican congress serving from 1997-2018, their party, seat type, state, education, legislative experience, gender, first year of session served, number of initiatives presented, number of initiatives published, their party seat share, and whether they were primary or substitute candidates.

Data for this study were obtained from the Mexican Ministry of Interior's Legislative Information System (SIL) and the National Electoral Institute (INE). Specifically, the "Integracion del H. Congreso de la Union" and the databases for initiatives presented of every legislature from 1997 to 2018 for both chambers. In addition, congresspeople's profiles were obtained from the SIL's deputy and senator portals. From these profiles, we collected their gender, last education degree completed, and whether they had prior experience as local deputies, federal deputies, and senators.[2] From the initiatives database, we collected the name of the initiative presenter, session year, and status. By using the name of the initiative presenter and the session year, we were able to merge all of the records into the single database outlined above.

We converted much of the information into binary or categorical variables. We created indicators of party memberships in PRI, PAN, PRD, and Morena parties and another to include the rest. We created a categorical variable to represent the last degree completed. 1 represents elementary and middle school, 2 represents high school and incomplete bachelor's, 3 represents technical degree, 4 represents bachelor's degree, and 5 represents masters or doctoral degrees. We created a binary variable for legislators

[2] Congressperson database does not include those who stepped down before the end of their tenure

elected through proportional representation and if they served post 2014 quota. Using information from the INE, we calculated seat share for each party. For independent legislators, we counted them as having one seat out of the total. We translated the status information into a binary variable that takes the value of 1 for initiatives published and 0 otherwise.

There was very little information about deputies' legislative experience and educational attainment prior to 2006 so we deleted any deputy entries prior to 2006 but kept senator entries all the way back to 1997. We also removed all the legislators that were not primary candidates for two reasons: first, so that all the people being evaluated have the same amount of time (3 years for deputies and 6 years for senators) to propose initiatives; second, to ensure that the congresspeople observed are those that the public voted for, whether directly, as is the case for single-member district candidates, or indirectly, for proportional representation candidates. The final database came out to have 2,069 deputies from 5 legislative sessions and 835 senators from 9 legislative sessions. Had there been no missing data, we would have expected to have 2,500 deputies and 1,024 senators. There is no reason to believe that there is a systematic reason behind the missing data points and thus our observation points should remain unbiased.

To conduct the triple difference-in-difference analysis, we replicated our original database and made necessary modifications. Firstly, we removed all legislators elected through proportional representation since they do not representing a single state. Subsequently, we introduced a binary variable that takes a value of 1 if the legislator was elected from a high-treatment state, and 0 otherwise. The classification of states into high or low treatment was based on the average percentage of females elected to congress

from each state from 1988 to 2012. States with a pre-quota average below the median value of 15% were considered high-treatment, while those with a value equal to or above the median were considered low-treatment. As a result of these adjustments, our triple-difference database comprised of 1,329 and 617 observations for deputies and senators, respectively.

V. Empirical Strategy

We use a combination of econometric strategies to capture the complexity of gender quotas and their impact on the quality of elected legislators in Mexico including multivariate OLS regressions, logit, and triple difference-in-difference models. Most case-studies exploring this question rely on difference-in-difference models exclusively because the quota is applied only to a portion of candidates or to some regions and not others. For instance, and like it was in Mexico before 2014, the quota often applies only to proportional representation candidates. Proportional representation candidates are observed as the treated group, and the rest as the control group. Given that the 2014 quota in Mexico affected the candidates of all states, and all at once, it is difficult to take the same approach as previous studies. Essentially, all candidates in Mexico were "treated" by this quota law. However, by distinguishing between below median and above median states in regard to female representation prior to the quota, we can more closely identify the 2014 gender quota as one of the causes for the observed changes in legislator quality.

The mechanisms for measuring quality are similar to those used by Catalano and Baldez (2015) and Besley, Folke, Persson, and Rickne (2017). In addition to using educational attainment and initiatives proposed as a proxy for politician quality, we use initiatives published. The same models are replicated for the upper and lower chambers of congress.

In order to estimate quality of congresspeople using initiatives presented as a proxy, we created the following models:

$$(1)\ ln(y_i) = \alpha_{\mathrm{i}} + \beta Fem_{\mathrm{i}} + \gamma Quota_{\mathrm{i}} + \delta(Fem * Quota)_{\mathrm{i}} + \mathrm{X}_{ji} + \varepsilon_i$$

$$(2)\ ln(\frac{P_i}{1-P_i}) = \alpha_{\mathrm{i}} + \beta Fem_{\mathrm{i}} + \gamma Quota_{\mathrm{i}} + \delta(Fem * Quota)_{\mathrm{i}} + \mathrm{X}_{ji} + \varepsilon_i$$

$$(3)\ x_i = \alpha_{\mathrm{i}} + \beta Fem_{\mathrm{i}} + \gamma Quota_{\mathrm{i}} + \delta(Fem * Quota)_{\mathrm{i}} + \mathrm{X}_{ji} + \varepsilon_i$$

where y_{i} is the number of initiatives greater than 0 presented per candidate, *P* is the probability that a congressperson will propose at least one initiative, and x_i is the number of initiatives published. X_{ji} is a vector representing the control variables *j* of congressperson *i* which are legislative experience, legislature served, proportional representation seat, party, party seat share, and education. The control variables for models (1), (2), and (3) are all the same.

An interesting phenomenon observed in the Mexican scenario is that the distribution of initiatives proposed is heavy-tailed right-skewed with a large portion of congresspeople presenting 0 initiatives. 16.29% of deputies and 19.64% of senators in the dataset did not propose a single initiative during their term. For this reason, we use a logit model to evaluate the conditions that push congresspeople to propose at least one initiative. Given the large distribution of initiatives, we use the natural log of initiatives in the OLS regression.

Fem_{i} and $Quota_{\mathrm{i}}$ are binary variables indicating whether the congressperson is female and whether they were serving post 2014 quota. $(Fem * Quota)$ is the variable of interest since it's the interaction between female and serving post quota. Legislative experience and party controls are indicator variables for whether candidates have experience as local deputies, federal deputies, or senators and whether the candidates are part of the PAN, PRD, Morena, or Other party. We excluded the PRI in order to analyze

the results with respect to the PRI which has been the historically dominant party in Mexico for the past century. The education control is an ordered categorical variable ranging from 1 through 5 indicating the congressperson's highest educational degree. 1 stands for primary or middle-school degree, 2 for high school degree, 3 for technical degree, 4 for bachelor's degree, and 5 for graduate degree.

To evaluate quality of congressperson using education as a proxy we developed the following model

$$(4)\ \ln\left(\frac{P_{i\leq k}}{P_{i>k}}\right) = \alpha_{\mathrm{i}} + \beta Fem_{\mathrm{i}} + \gamma Quota_{\mathrm{i}} + \delta(Fem * Quota)_{\mathrm{i}} + \mathrm{X}_{ji} + \varepsilon_i$$

where $P_{i\leq k}$ is the probability that the congressperson *i* obtained a degree of category *k* or lower and $P_{i>k}$ is the probability that congressperson *i* obtained a degree in category *k* or higher. The outcome variable is not controlled by the legislature year in this model because there is no reason to believe that the legislature that the congressperson served in has an impact on the level of education that the individual attained. State fixed effects were calculated for all models.

We implement a difference-in-difference model where the difference being captured is between low-treatment and high-treatment states. We repeat models (1), (3), and (4) using our second database. We create two additional interaction terms, one that interacts treatment size and post quota, and another that interacts treatment size, post quota and female. The model specifications are as follows:

$$(5)\ ln(y_i) = \alpha_i + \beta Fem_i + \gamma Quota_i + \delta(Fem * Quota)_i + \lambda Treat + \theta(Quota * Treat) + \mu(Quota * Treat * Fem) + X_{ji} + \varepsilon_i$$

$$(6)\ x_i = \alpha_i + \beta Fem_i + \gamma Quota_i + \delta(Fem * Quota)_i + \lambda Treat + \theta(Quota * Treat) + \mu(Quota * Treat * Fem) + X_{ji} + \varepsilon_i$$

$$(7)\ ln\left(\frac{P_{i\leq k}}{P_{i>k}}\right) = \alpha_i + \beta Fem_i + \gamma Quota_i + \delta(Fem * Quota)_i + \lambda Treat + \theta(Quota * Treat) + \mu(Quota * Treat * Fem) + X_{ji} + \varepsilon_i$$

VI. Results

In this section, we highlight the key findings from the models run on each of the two legislative chambers. Table 1 and Table 2 display summary statistics for the original database and the database for our difference-in-difference models. Table 3 and Table 4 show the impact of the 2014 gender quota on legislative productivity and educational attainment. Finally, Table 5 and Table 6 address the results for our triple difference models.

Table 1: Summary Statistics

	Deputies					*Senators*				
	Obs	Mean	St.dev.	Min	Max	Obs	Mean	St. dev.	Min	Max
Female	2,069	0.36	0.482	0	1	835	0.257	0.438	0	1
Post-Quota	2,069	0.41	0.492	0	1	835	0.236	0.425	0	1
PR	2,069	0.401	0.490	0	1	835	0.259	0.439	0	1
Initiatives										
Presented	2,069	8.134	12.046	0	165	835	9.932	27.881	0	615
Published	2,069	0.554	1.137	0	14	835	0.91	2.219	0	40
> 0	2,069	0.837	0.369	0	1	835	0.804	0.398	0	1
Experience										
Local Dep.	2,069	0.374	0.484	0	1	835	0.424	0.494	0	1
Fed. Dep.	2,069	0.18	0.385	0	1	835	0.642	0.479	0	1
Senator	2,069	0.055	0.228	0	1	835	0.346	0.476	0	1

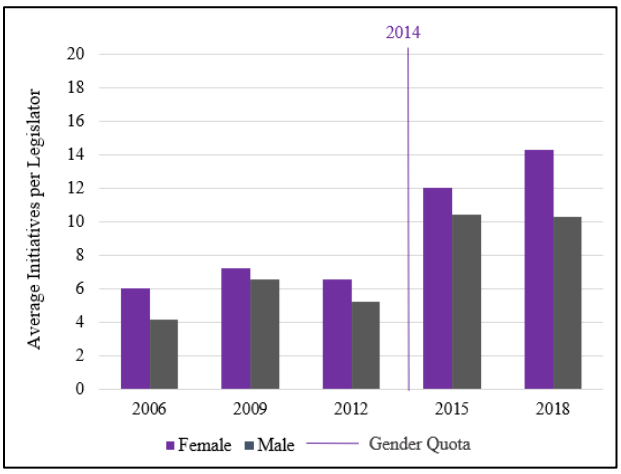
Table 2: Summary Statistics for Difference-in-Difference Models

	Deputies					*Senators*				
	Obs	Mean	St. dev.	Min	Max	Obs	Mean	St. dev.	Min	Max
Female	1,239	0.315	0.465	0	1	617	0.222	0.416	0	1
Post-Quota	1,239	0.411	0.411	0	1	617	0.238	0.426	0	1
High Treat	1,239	0.465	0.465	0	1	617	0.428	0.495	0	1

A. Key Findings of Gender Quota Impact on Legislative Productivity

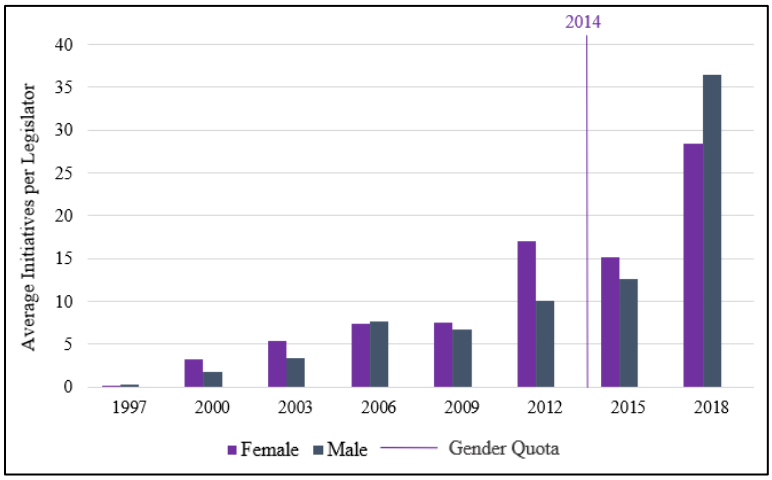
We find that the 2014 quota is significantly associated with an increase in initiatives presented, initiatives published, and the likelihood of presenting at least one initiative in the lower chamber. However, being female is associated with a predicted increase of 21% in the number of initiatives presented, regardless of whether they served pre or post quota. This shows that female deputies, generally, are more productive when using initiatives presented as a proxy. Critically, deputies serving post quota are predicted to present 31.4% more initiatives and publish 0.65 more bills. Additionally, they are 2.54 times more likely to present at least one initiative. This indicates that the legislative productivity of deputies increases post quota suggesting that the gender quota raised the quality of deputies elected, across genders. This is likely the case given that the interaction between being female and serving post quota is not statistically significant. Figure 6 illustrates how the average number of initiatives presented increased dramatically for both male and female deputies following the 2014 gender quota.

Figure 6: Average Number of Initiatives per Deputy



It's interesting to observe the opposite occur for senators. Although the number of initiatives presented and the likelihood of presenting at least one initiative are not significant, the number of initiatives published falls by a greater amount than the increase observed in deputies. Although this alone might indicate a fall in senator quality post quota, our education model discussed in part *B* suggests otherwise.

Figure 7: Average Number of Initiatives per Senator



We also find that schooling, party, and seat share have a significant impact on the initiatives presented and published by deputies. As expected, one more degree of schooling is associated with an increase in the number of initiatives published and presented. In Mexico, the ruling party does not necessarily propose the majority of initiatives as can be seen from Figure 8 and 9. In fact, deputies from smaller parties are associated with significantly more initiatives proposed and published. Perhaps, these legislators have more pressure to prove themselves since their spot in the next election is less safe than it is for representatives of dominant parties. The black crosses point out the party who during that legislative session had the highest seat share.

Figure 8: Total Initiatives Proposed per Party (Lower Chamber)

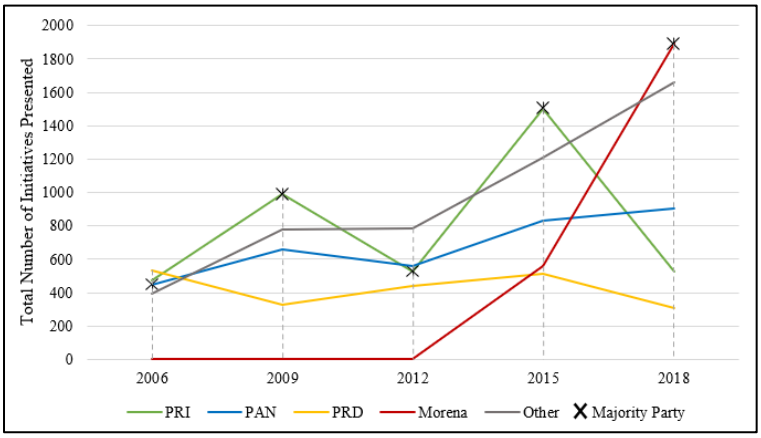
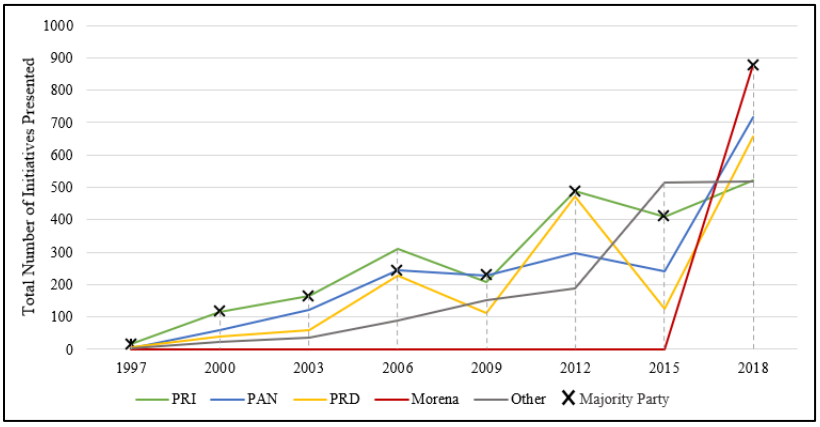


Figure 9: Total Initiatives Proposed per Party (Upper Chamber)



An unexpected finding is that the seat share of the deputies' party is associated with fewer initiatives published and a lower likelihood of presenting at least one initiative. One explanation for this is free-riding between deputies of the same party where certain deputies propose most of the initiatives of the party and the rest are simply there to vote.

Some interesting findings among senators are how legislative experience and the seat type impact initiatives. Having experience as a senator reduces the likelihood of senators to present at least one initiative and reduces the number presented and published. One explanation for this phenomenon is that more senior senators choose to allocate their

time in different legislative tasks such as lobbying rather than drafting new laws. Additionally, senators elected through proportional representation have lower legislative productivity. This could be evidence of a common critique of Mexico's proportional representation system that officials elected through this system are worse than those tied to a geographic area.

Table 3: The Impact of the 2014 Gender Quota on Legislative Productivity

	Deputies			*Senators*		
Dependent Variable:	Initiatives Presented	Initiatives > 0	Initiatives Published	Initiatives Presented	Initiatives > 0	Initiatives Published
Model:	OLS	Logit	OLS	OLS	Logit	OLS
FEMALE	0.209***	0.150	0.0739	0.125	0.741**	0.0423
	(0.0678)	(0.175)	(0.0706)	(0.116)	(0.357)	(0.142)
FEM * POSTQUOTA	0.0715	0.378	-0.00366	0.120	-0.860	0.336
	(0.0954)	(0.305)	(0.103)	(0.191)	(1.321)	(0.254)
POSTQUOTA	0.314***	0.932***	0.654***	-0.0771	0.184	-0.943***
	(0.105)	(0.296)	(0.110)	(0.158)	(0.838)	(0.204)
LOCAL DEP.	-0.00145	0.345**	0.00112	0.154**	0.492*	0.0784
	(0.0487)	(0.142)	(0.0520)	(0.0781)	(0.265)	(0.0985)
FEDERAL DEP.	0.0358	0.302	0.0212	0.000489	0.141	0.0491
	(0.0635)	(0.197)	(0.0689)	(0.0843)	(0.259)	(0.101)
SENATOR	0.00941	-0.298	-0.0315	-0.271***	-0.977***	-0.175*
	(0.107)	(0.304)	(0.114)	(0.0889)	(0.255)	(0.103)
YEAR	0.0265**	-0.0369	-0.0295**	0.105***	0.230***	0.0679***
	(0.0116)	(0.0309)	(0.0120)	(0.00992)	(0.0289)	(0.0109)
PR	0.0446	-0.0450	0.0610	-0.269*	-1.052***	-0.397***
	(0.0511)	(0.148)	(0.0545)	(0.137)	(0.317)	(0.150)
PAN	-0.0930	-0.377**	0.0392	-0.241**	0.425	-0.234**
	(0.0675)	(0.189)	(0.0710)	(0.0934)	(0.280)	(0.115)
PRD	0.0674	0.00817	0.00335	0.00190	1.186**	-0.192
	(0.0846)	(0.242)	(0.0896)	(0.135)	(0.490)	(0.173)
MORENA	0.0856	0.646**	-0.0516			
	(0.0879)	(0.291)	(0.0945)			
OTHER PARTY	0.494***	1.329***	0.392***	-0.207	1.989**	-0.236
	(0.0760)	(0.299)	(0.0831)	(0.152)	(0.839)	(0.195)
SEAT SHARE	-0.861***	-2.230***	-0.206	-0.634*	0.134	-0.0886
	(0.161)	(0.633)	(0.178)	(0.350)	(0.869)	(0.361)
SCHOOLING	0.125***	0.443***	0.137***	0.0512	0.224	0.163**
	(0.0246)	(0.0621)	(0.0250)	(0.0542)	(0.167)	(0.0663)
Observations	1,732	2,069	2,069	599	754	755
R-squared	0.220		0.107	0.425		0.155

Standard errors in parentheses

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

B. Key Findings of Gender Quota Impact on Educational Attainment

Our results indicate that it's more likely that deputies and senators elected after the 2014 quota have a higher degree of schooling which complements our findings when using initiatives as a measure for quality. The insignificant result from our post quota and female interaction indicates that the increase in education stems from male and female officials alike. We also find that representatives from Morena and the PRD parties are significantly more likely to have a lower degree of schooling. From our study, it is not clear why this is the case.

Table 4: The Impact of the 2014 Gender Quota on Educational Attainment of Deputies and Senators

	Deputies	*Senators*
Dependent Variable:	Education	Education
Model:	Ologit	Ologit
FEMALE	-0.157	-0.0860
	(0.124)	(0.0798)
FEM * POSTQUOTA	0.0529	0.0368
	(0.182)	(0.143)
POSTQUOTA	0.273**	0.196**
	(0.122)	(0.0917)
LOCAL DEP.	0.0608	-0.0359
	(0.0921)	(0.0553)
FEDERAL DEP.	0.0137	-0.0486
	(0.122)	-0.0573
SENATOR	0.460**	0.0937
	(0.202)	(0.0581)
PR	0.0978	0.0432
	(0.0945)	(0.0826)
PAN	-0.0776	0.178***
	(0.119)	(0.0625)
PRD	-0.417***	0.201**
	(0.151)	(0.0859)
MORENA	-0.653***	
	-0.166	
OTHERPARTY	-0.149	-0.0138
	(0.143)	(0.109)
Observations	2,069	755

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

C. Key Findings of Difference-in-Difference Model

Judging by both legislative productivity and education, the previous findings are evidence that the 2014 gender quota is significantly correlated with higher quality congresspeople. Our difference-in-difference models, however, give us a more nuanced perspective of what is driving the hike in initiatives and educational attainment of post-quota representatives. We should expect to observe an even larger impact of gender quotas on legislative productivity and education in states that were, on average, farther away from the 50-50 quota prior to 2014. These are the states that we refer to as "high-treatment."

The estimator of interest is the three-way interaction between the quota, the treatment size, and gender. Our results indicate that this three-way interaction is statistically significant among deputies for both initiatives published and presented. Female legislators from a high-treatment state post quota are predicted to present 33% more initiatives than our baseline--pre-quota males from low-treatment states. We also find that post-quota female deputies from high-treatment states publish 0.35 more initiatives than the baseline. These results are consistent with our education model showing that female deputies from high-treatment states serving post quota are significantly more likely to have a higher degree of schooling than the baseline. Not only are these congresswomen more active legislators, but they are also more educated. Tables 5 and 6 display these findings.

Table 5: Legislative Productivity Between Congresspeople from High-Treatment and Low-Treatment States[3]

	Deputies				*Senators*			
Dependent Variable:	Initiatives Presented		Initiatives Published		Initiatives Presented		Initiatives Published	
Model:	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
FEMALE	0.155	0.157	0.0966	0.0969	-0.0239	-0.0577	-0.0416	-0.0675
	(0.0964)	(0.0965)	(0.0920)	(0.0921)	(0.140)	(0.142)	(0.181)	(0.183)
POSTQUOTA	0.491***	0.593***	0.569***	0.648***	-0.135	-0.132	-1.039***	-0.991***
	(0.136)	(0.154)	(0.130)	(0.149)	(0.172)	(0.208)	(0.234)	(0.284)
FEM*POSTQUOTA	0.0430	-0.127	-0.106	-0.280*	0.304	0.144	0.431	0.181
	(0.130)	(0.157)	(0.128)	(0.156)	(0.206)	(0.246)	(0.285)	(0.345)
HIGHTREAT		-0.289		-0.267		0.378		0.693
		(0.374)		(0.363)		(0.337)		(0.429)
POSTQUOTA* HIGHTREAT		-0.191		-0.144		0.00461		-0.0838
		(0.145)		(0.143)		(0.231)		(0.322)
FEM*POSTQUOTA *HIGHTREAT		0.333*		0.355**		0.507		0.721
		(0.176)		(0.180)		(0.321)		(0.460)
SCHOOLING	0.140***	0.139***	0.124***	0.122***	0.0424	0.0425	0.187**	0.187**
	(0.0323)	(0.0323)	(0.0302)	(0.0302)	(0.0587)	(0.0586)	(0.0770)	(0.0769)
Observations	1,024	1024	1,239	1,239	506	506	617	617
R-squared	0.250	0.253	0.120	0.123	0.439	0.444	0.164	0.168

Standard errors in parentheses

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

[3] See Appendix for the complete version of the table.

Table 6: Educational Attainment Between Congresspeople from High-Treatment and Low-Treatment States[4]

	Deputies		*Senators*	
Dependent Variable	Education Category		Education Category	
Model:	Ologit	Ologit	Ologit	Ologit
FEMALE	-0.230	-0.233	0.288	0.303
	(0.175)	(0.175)	(0.288)	(0.291)
POSTQUOTA	0.246	0.361*	0.866***	0.911**
	(0.160)	(0.211)	(0.286)	(0.376)
FEM*POSTQUOTA	0.0412	-0.254	-0.538	-0.520
	(0.245)	(0.300)	(0.454)	(0.542)
HIGHTREAT		0.701		-2.088***
		(0.689)		(0.680)
POSTQUOTA*HIGHTREAT		-0.199		-0.0937
		(0.278)		(0.514)
FEM*POSTQUOTA*HIGHTREAT		0.614*		-0.117
		(0.351)		(0.744)
Observations	1,239	1,239	617	617
Standard errors in parentheses			*** p<0.01, ** p<0.05, * p<0.1	

[4] See Appendix for the complete version of the table.

VII. Discussion

Evaluating all of our results in tandem helps us gain perspective on how Mexico's experience with gender quotas in congress relates to findings from similar research in other countries. Overall, we observe that males and females are not of significantly different quality post quota, judging by education and legislative productivity. Even though female deputies do present more initiatives, they publish at about the same rate as male deputies. These findings are consistent with those of Callen, Cutts, and Campbell in their case study of gender quotas in Britain and Baltrunaite, Bello, Casarico, and Profeta's case study of Italy, even though they explore this relationship in very different contexts and for elected government positions other than congresspeople.

Some studies have found that not only are male and female elected officials equally qualified, but that gender quotas lead to high-quality females replacing low-quality males. Besley, Golke, Persson, and Rickne's 2017 Swedish case study shows strong evidence of this. Our research does not indicate such outcomes. Rather, our data shows that it could be a normative change within the lower chamber of congress that is driving everyone to propose and publish initiatives at a higher rate. We cannot prove from this study that gender quotas caused such an effect, but the results of our legislative productivity models certainly suggest that possibility.

Our three-way interaction term signals that gender quotas impact the quality of people elected in a different way that traditional gender quota models would predict. We would have expected that post quota, there would be a similar rate of high-quality females across states. However, we see that the increase in high-quality female

representatives is mainly driven from representatives of states that used to be lagging behind the gender ratio median.

We predict that the gender quota created a shift in culture in the lower chamber of congress that impacted the incentives of females to participate in congress. High-performing females from lagging states were choosing career paths outside of politics prior to the quota, at a higher-rate. The gender quota forced political parties to seek out eligible female candidates. As the rate of female representatives from lagging states increased, so did the impact that one female legislator could have through the support of other congresswomen. This logic could have induced a network effect that has led to the even stronger increase of high-performing females in high-treatment states. The influx of these representatives in congress likely raised the bar for everyone else, which further explains the hike in the legislative productivity of all legislators observed in models (1)-(3).

VIII. Limitations and Conclusion

We acknowledge that quality is a difficult attribute to measure and that it is the most significant setback of this paper. We attempted to attenuate this limitation by using two very different measures of quality which we could then compare. Although our findings of legislative productivity and educational attainment are generally compatible, further research should use alternative measures of quality to evaluate whether our inferences remain applicable.

Overall, our study provides further evidence that gender quotas are a powerful tool for improving the gender ratio in parliaments but whose positive impacts go beyond the importance of female representation. Far from reducing the overall quality of a parliament, gender quotas in this study show to be associated with a boost in legislative productivity among males and females alike and an increase in the educational attainment of elected officials. Additionally, we observe that gender quotas can improve representation in more ways than simply by forcing a shift along the supply and demand curve for female legislators. Gender quotas can also increase the perceived impact that females can have as deputies. As more high-quality females are attracted to the role, said perceptions materialize. With many other forms of gender inequalities still pervasive in Mexican society, having productive and educated female voices is a crucial step towards achieving broader gender parity.

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X. Appendix

Table 5: Legislative Productivity Between Congresspeople from High-Treatment and Low-Treatment States

QUOTA	*Deputies*				*Senators*			
Dependent Variable:	Initiatives Presented		Initiatives Published		Initiatives Presented		Initiatives Published	
Model:	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
FEMALE	0.155	0.157	0.0966	0.0969	-0.0239	-0.0577	-0.0416	-0.0675
	(0.0964)	(0.0965)	(0.0920)	(0.0921)	(0.140)	(0.142)	(0.181)	(0.183)
POSTQUOTA	0.491***	0.593***	0.569***	0.648***	-0.135	-0.132	-1.039***	-0.991***
	(0.136)	(0.154)	(0.130)	(0.149)	(0.172)	(0.208)	(0.234)	(0.284)
FEM*POSTQUOTA	0.0430	-0.127	-0.106	-0.280*	0.304	0.144	0.431	0.181
	(0.130)	(0.157)	(0.128)	(0.156)	(0.206)	(0.246)	(0.285)	(0.345)
HIGHTREAT		-0.289		-0.267		0.378		0.693
		(0.374)		(0.363)		(0.337)		(0.429)
POSTQUOTA* HIGHTREAT		-0.191		-0.144		0.00461		-0.0838
		(0.145)		(0.143)		(0.231)		(0.322)
FEM*POSTQUOTA* HIGHTREAT		0.333*		0.355**		0.507		0.721
		(0.176)		(0.180)		(0.321)		(0.460)
DIPUTADO LOCAL	-0.00789	-0.00929	0.0524	0.0507	0.0811	0.0848	0.0676	0.0716
	(0.0636)	(0.0635)	(0.0619)	(0.0619)	(0.0857)	(0.0855)	(0.115)	(0.115)
DIPUTADO FEDERAL	0.0789	0.0760	0.149*	0.146	-0.0462	-0.0538	0.0186	0.0121
	(0.0909)	(0.0908)	(0.0902)	(0.0902)	(0.0912)	(0.0918)	(0.118)	(0.119)
SENADOR	0.0399	0.0301	0.296	0.286	-0.259**	-0.246**	-0.164	-0.150
	(0.224)	(0.224)	(0.234)	(0.234)	(0.100)	(0.101)	(0.124)	(0.125)
YEAR	0.0114	0.0109	-0.0339**	-0.0342**	0.115***	0.115***	0.0739***	0.0739***
	(0.0157)	(0.0157)	(0.0148)	(0.0148)	(0.0109)	(0.0109)	(0.0129)	(0.0129)
PAN	-0.149	-0.149	0.0398	0.0383	-0.236**	-0.234**	-0.195	-0.193
	(0.0946)	(0.0946)	(0.0911)	(0.0910)	(0.101)	(0.101)	(0.135)	(0.135)

Table 5: Legislative Productivity Between Congresspeople from High-Treatment and Low-Treatment States (Continued)

PRD	-0.0343	-0.0356	-0.0672	-0.0739	-0.0666	-0.0610	-0.263	-0.257
	(0.114)	(0.115)	(0.112)	(0.112)	(0.155)	(0.155)	(0.209)	(0.209)
MORENA	0.0856	0.0865	0.227**	0.227**				
	(0.115)	(0.115)	(0.114)	(0.114)				
OTHER PARTY	0.469***	0.461***	0.585***	0.573***	-0.565***	-0.598***	-0.205	-0.252
	(0.109)	(0.109)	(0.110)	(0.110)	(0.208)	(0.208)	(0.283)	(0.284)
SEATS	-0.888***	-0.899***	-0.443*	-0.466*	-0.404	-0.364	-0.0314	-0.00223
	(0.239)	(0.240)	(0.243)	(0.244)	(0.413)	(0.412)	(0.445)	(0.445)
SCHOOLING	0.140***	0.139***	0.124***	0.122***	0.0424	0.0425	0.187**	0.187**
	(0.0323)	(0.0323)	(0.0302)	(0.0302)	(0.0587)	(0.0586)	(0.0770)	(0.0769)
Observations	1,024	1024	1,239	1,239	506	506	617	617
R-squared	0.250	0.253	0.120	0.123	0.439	0.444	0.164	0.168

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 6: Educational Attainment Between Congresspeople from High-Treatment and Low-Treatment States

	Deputies		*Senators*	
Dependent Variable	Education Category		Education Category	
Model:	Ologit	Ologit	Ologit	Ologit
FEMALE	-0.230	-0.233	0.288	0.303
	(0.175)	(0.175)	(0.288)	(0.291)
POSTQUOTA	0.246	0.361*	0.866***	0.911**
	(0.160)	(0.211)	(0.286)	(0.376)
FEM*POSTQUOTA	0.0412	-0.254	-0.538	-0.520
	(0.245)	(0.300)	(0.454)	(0.542)
HIGHTREAT		0.701		-2.088***
		(0.689)		(0.680)
POSTQUOTA* HIGHTREAT		-0.199		-0.0937
		(0.278)		(0.514)
FEM*POSTQUOTA* HIGHTREAT		0.614*		-0.117
		(0.351)		(0.744)
LOCAL DEP.	-0.0302	-0.0308	-0.109	-0.110
	(0.120)	(0.120)	(0.182)	(0.182)
FEDERAL DEP.	0.0986	0.0955	-0.339*	-0.343*
	(0.175)	(0.175)	(0.186)	(0.189)
SENATOR	1.160**	1.139**	0.146	0.145
	(0.457)	(0.458)	(0.192)	(0.193)
PAN	-0.172	-0.170	0.360*	0.362*
	(0.161)	(0.161)	(0.204)	(0.204)
PRD	-0.203	-0.209	0.704**	0.706**
	(0.204)	(0.204)	(0.301)	(0.301)
MORENA	-0.242	-0.257		
	(0.214)	(0.215)		
OTHERPARTY	-0.156	-0.186	-0.236	-0.234
	(0.211)	(0.212)	(0.426)	(0.428)
Observations	1,239	1,239	617	617

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1