Congress Composition and Electoral Advantage

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Abstract

In 2003, an electoral reform changed the mechanism to assign seats in the Colombian Congress. I simulate the 2006 Senate elections using the previous assignment mechanism to determine which senators benefited from the reform, i.e. would have not been elected had the reform not been made. With the results of the simulation, I use a regression discontinuity design to compare the senators that would have been barely elected anyways with those who would have lost, but were near to be elected. I check the differences in the amount of law drafts presented, the attendance to voting sessions, and a discipline index for each senator as proxy of their legislative behavior. I find that the senators benefiting from the reform present a different legislative behavior during the 4-year term with respect to the senators that would have been elected anyways. Since the differential legislative behavior cannot be interpreted as being better (worse) politician, I examine if the behavioral difference gives them an electoral advantage. I find no difference in the electoral result of 2010 Senate election in terms of the probability of being (re)elected in 2010, the share of votes, the share of votes within their party list, and the concentration of their votes. Additionally, I check the probability of being investigated for links with paramilitary groups and I find no differences. The results suggest that political reforms can change the composition of governing or legislative bodies in terms of performance, but it does not necessarily translate into an electoral advantage.

Key words: Colombia, Senate, political reform, senators, Hare quota, regression discontinuity, legislative behavior.

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1 Introduction

In 1991 a new Constitution brought different changes in the Colombian political arena. It favors political competition by lowering entry barriers that restricted political participation. This allowed not only the traditional political parties (Conservative and Liberal) but any new party or movement to run in any election. As a consequence, new political parties began to take place in the Congress, the Departmental Assembly, and the Municipal Council.

Particularly in the Congress, one of the changes was introducing the national electoral district in the Senate in order to allow the new candidates and movements, who were not strong enough at the regional level, to present a national candidacy and to get votes from different regions and a broader electorate so as to they could been elected (Roland and Zapata, 2005, and Rodríguez-Raga, 2001).

A consequence of lowering entry barriers was the proliferation of small parties in the Senate as well as fractionalized lists from bigger parties (Hoskin et al., 2011). Due to this proliferation, among other reasons, a political reform was held in 2003 (Battle and Puyana, 2013). The reform limited the number of lists and candidates that each party could present to only one list with at most the same number of candidates as public offices to be provided. At the same time, it changed the seats' assignment mechanism to the Senate adopting D'Hondt method. Under this mechanism, seats are assigned proportionally to party lists; therefore, a candidate who did not get as many votes as other candidate could get a seat if his party has enough votes.

These changes generate a unique scenario to evaluate its effects as the number of public offices to be provided is not modified while the assignment mechanism is (Pachón and Shugart, 2010). Then, I can simulate the 2006 Senate elections using the actual results but the assignment mechanism used previous to the reform, namely Hare quota and largest remainders system. Under this mechanism, if there are M public offices to be provided, the seats go to the first M candidates ordered from the highest voting to the lowest voting. Hence, the seats go to the candidates who obtained more votes, regardless of their party (Pachón and Shugart, 2010). Therefore, the senators that would have not been elected in the simulation are the ones who did not obtained the minimum number of votes needed to get a seat had the Hare quota been maintained.

The purpose of this study is to compare the legislative behavior between the senators that would have been elected with respect to the ones that would have lost the election in the simulation. As the senators that would have not been elected, had the reform not been made, are the ones who obtained fewer votes among all the elected senators. Then, I would expect that this group of senators will make an effort to try to improve their vote share in the subsequent election, with respect to the senators that would have been elected anyways.

To test this hypothesis, I use a sharp regression discontinuity design where the senators that would have not got a seat using Hare quota assignment mechanism are the treatment group, and those who would have got a seat anyways are the control group. The identifying assumption is that the two types of senators are comparable. This is likely the case if both get a similar share of votes. Therefore, I test for differences in the legislative behavior between the senators of these two groups who are near the minimum share of votes needed to get a seat in the simulation.

When comparing the legislative behavior in the 4-year term of the senators near the threshold, using as proxy of legislative behavior the amount of law drafts presented, a discipline index, and the attendance to voting sessions, I find that the senators that would have not been elected had the reform not been made present a differential behavior with respect to the ones that would have been elected anyways. In particular, the treated senators present more law drafts, are more disciplined, and attend to more voting sessions.

Since there is a differece in behavior between the groups of senators cannot be interpreted as making better (worse) senators or politicians, then it can be due to senators looking for an electoral return in the subsequent (2010) Senate election. Therefore, I check the differences in the electoral returns and I find no difference in the probability of being elected. Additionally, I find no difference in the share of votes they obtained in 2010 election, in their share of votes within their party list, and in the concentration of their voting. Also, I check the probability of the senators running in 2010 Senate election being investigated for links with paramilitary groups and I find that neither group is more likely of being investigated.

Overall, my results suggest that the group of senators that would have not been elected had the reform not been made have a different legislative behavior with respect to the group of senators that would have been elected anyways. Particularly, the senators that would have not been elected present more law drafts, are 20% more disciplined, and attend to at least 4% more voting sessions when compared to the groups of senators that would have been elected anyways. However, when I check the electoral returns in the subsequent election, I find no effect of the differential behavior in the electoral returns. Thus, the legislative behavior of the senators during the 4-year term seems not to be related with their results in the subsequent election.

2 Background: Colombian political system

The 1991 Constitution reformed the electoral process. One of the objectives was to allow any groups of citizens to take part in the elections. In order to do this, entry barriers to political competition were lowered, allowing the participation of any new movement or party, different to the traditional Conservative and Liberal Party. However, according to Roland and Zapata (2005), the most important change introduced was establishing the election to the Senate at a national level, allowing the candidates to present a national candidacy in order to find a broader electorate.

Effectively, the number of parties running in the Senate election increased along with the number of parties elected but another consequence of lowering entry barriers was an increase in the number of list running. Figure 1 shows, for every Senate election held from 1991 onwards, in panel A, the number of parties elected while in panel B, the number of lists running. As we can see, both the number of parties elected and the number of lists running are increasing over the years up to 2002, the last election before the political reform was implemented. The political reform helped not only diminish the number of parties elected but also the number of list running, as it restrict the number of lists and candidates each party could present to the elections.

According to Cárdenas, Junguito, and Pachón (2006), the Hare quota and largest remainders system generates incentives for parties to fragment into factions, especially for the ones that are large enough to get at least one seat allocated by quota.[1] Then, as to maximize their chances to increase their number of seats, the traditional parties were dividing their list, having lists by factions, increasing the total number of list running under their party label.

But, the proliferation of parties led to a Senate full of small parties in which cooperation was harder to achieve declining governability. To strength the parties (Botero and Rodríguez-Raga, 2009) and to stop the proliferation of small parties (Battle and Puyana, 2013), among others reasons, in July

[1] Because of the Hare quota and largest remainders, the seats are first allocated to the lists that surpass the quota and the remaining seats are allocated to the lists with largest remainders. Cox and Shugart (1995) show how a party can obtain additional seats by running multiple lists.

2003, the Colombian Congress approved the *acto legislativo 01 de 2003* which modified the rules of the electoral process. The changes introduced by the reform that matter to this work are:[2]

- It established a minimum share of votes (threshold) in the election in order for a party or movement to be recognized.
- It established that only the candidates of a recognized party or movement can get a seat.
- It prohibited any candidate or citizen to be member of more than one party.
- It adopted a unique list of candidates for each party and the preferential vote.
- It changed the assignment mechanism, passing from Hare quota to D'Hondt method.[3]

3 Methodology

3.1 Quasi-experiment

Using the 2006 Senate election results, I simulate the election but instead of using D'Hondt method as the assignment mechanism, I use Hare quota and largest remainders mechanism. Also, I use all the candidates who run in the 2006 Senate election, included the ones from parties that were not recognized, as they did not surpass the threshold requirement, but could have got a seat under the previous assignment mechanism. The results of the simulation are summarized in table 1.

There are 4 groups of 2006 Senate election candidates. The first two groups are candidates who actually got a seat in 2006 election using D'Hondt method and candidates who did not get a seat in 2006 election using D'Hondt method. Each of these groups is made up of the candidates that would have been elected using Hare quota as assignment mechanism and the candidates that would have not been elected using Hare quota.

As I am going to compare the legislative behavior of the senators during the 4-year term, only the candidates who actually got a seat in 2006 are of interest, no matter if in the simulation they would have been elected or not. Then, I keep 98 senators[4] and rule out the rest of candidates. Then, according to table 1 there are 22 senators that would have not been elected had the reform not been made, while there are 76 senators that would have been elected anyways.

3.2 Regression Discontinuity

I can define a treatment indicator variable W for treatment and control group using the results of the simulation. Recall that the individuals who belong to the treatment groups are the senators that got a seat in 2006 but would have not using Hare quota as assignment mechanism, or the senators benefiting from the reform. The control group, in contrast, is the senators who would have been elected anyways. Then, the indicator variable is:

$$W_i = \begin{cases} 1 & \text{if benefited from the reform,} \\ 0 & \text{if not benefited from the reform.} \end{cases}$$

[2]For a more detailed explanation of the reform, I suggest see Battle and Puyana (2013), Durán (2006) or Rodríguez-Raga and Botero (2006).

[3]I briefly expose both assignment mechanisms in the appendix. For further details and examples, I suggest see Róbles (2005).

[4]Even though there are 102 senators, I ruled out the 2 senators elected from a closed list, as I cannot input votes at the individual level, and the senators elected from special circumscriptions, as they do not run against all the other candidates.

Because there is no minimum share of votes, or number of votes, needed to get a seat, I define a threshold k as the share of votes at the national level the last candidate that would have been elected using Hare quota obtained. The share of votes each senator got is the amount of votes divided by the total valid votes at the national level. Then, for each senator i, let k be the threshold such that:

$$k = min\{share_i | seat_i^{HQ} = 1\} \tag{1}$$

where $share_i$ is the share of votes each candidate i obtained in 2006 election, and $seat_i^{HQ}$ is a dummy variable that takes the value of 1 if the senator i would have got a seat using Hare quota as assignment mechanism but the votes he obtained in 2006.

After that, I define the running variable as the relative distance between the threshold k and the share of votes each senator i obtained ($share_i$). Then, for each senator i, let Z be the running variable such that $Z_i = share_i - k$. Note that, by construction, there is a senator j whose share of votes is the same as the threshold, therefore $Z_j = 0$.

Then, the share of votes of all the senators is normalized, where positive values of Z means been elected anyways; negative, been elected in 2006 but would have not using Hare quota and $Z = 0$ is the threshold redefined as $\bar{Z} = Z = 0$. Because of this normalization, I can redefine the treatment indicator W as a function of the running variable Z:[5]

$$W_i = \begin{cases} 1 & \text{if } Z_i < 0 \\ 0 & \text{if } Z_i \geq 0 \end{cases}$$

Next, I define the outcome variable Y. I use three measures as proxy for legislative behavior: the first one is the number of law drafts presented by each senator. The variable count how many law drafts presented each senator as author during the 4-year term. The second variable is a discipline index elaborated by *Congreso Visible* called the Partisan Agreement Index; it takes values between 0 and 1, where 1 means that the senator has been fully disciplined; and zero, the opposite.[6] The third outcome variable is the number of times a senator attends to a voting session. Table 2 summarize the main variables used by treatment and control group. Panel A shows the share of votes of each senator as well as the normalized share of votes; while panel B, the three outcome variables.

I use a sharp regression discontinuity design to test differences in the outcomes of the senators using both a non-parametric approach and a parametric approach. For the non-parametric approach, I follow Angrist and Pischke (2009), Imbens and Lemieux (2008), and Lee and Lemieux (2010) model of a local polynomial regression, given by:

$$Y_i = \alpha + \theta W_i + \delta f(z_i) + \epsilon_i \tag{2}$$

where Y_i is the outcome variable for senator i, W_i is the treatment indicator variable for senator i, and $f(\cdot)$ is the pth-order polynomial in the share of votes z_i. The variable z_i is the share of votes each senator i obtained but defined for values of z such that $z = |Z - \bar{Z}| < h$, where $\bar{Z}$ is the minimum normalized share of votes that a senator would have need to get a seat in the simulation. This specification allows me to calculate the Local Treatment Effect. Robust standard errors are used.

Lee and Lemiuex highlight the importance of the non-parametric results since, as they said, "there is no particular reason to believe that the true model is linear," and "the consequences of using an incorrect functional form are more serious in the case of RD designs however, since misspecification

[5] As Angrist and Pischke (2009) suggest, the key difference between and RDD and others regressions is that the treatment variable W is not only correlated with Z, but it is a deterministic function of the latter because once we know Z_i we know W_i. No matter how close Z_i gets to $\bar{Z}$, treatment is unchanged until $Z_i = \bar{Z}$

[6] For further details, see Quiroga, Jacobo, and Camacho (2013).

of the functional form typically generates a bias in the treatment effect." (Lee and Lemiuex, 2010, p316)

To show the non-parametric result I use the Wald estimator, and as a robustness check, I estimate it for half, twice, and 1.5 times the bandwidth. Recall that, if Y represents the outcome, Z is the running variable, W is the treatment indicator variable and the cut-off point ($Z = 0$) is represented by $\bar{Z}$, then the Wald estimator is defined as:

$$\begin{aligned}\theta_{Wald} &= \lim_{\Delta \to 0} E[Y_i | W_i = 0, \bar{Z} < Z_i < \bar{Z} + \Delta] - E[Y_i | W_i = 1, \bar{Z} - \Delta < Z_i < \bar{Z}] \\ &= \lim_{\Delta \to 0} E[Y_i(0) | \bar{Z} < Z_i < \bar{Z} + \Delta] - E[Y_i(1) | \bar{Z} - \Delta < Z_i < \bar{Z}] \\ &= E[Y_i(0) - Y_i(1) | Z_i = \bar{Z}] \end{aligned} \tag{3}$$

Then, the Wald estimator is the difference in the expected value of the outcome of the control group minus the outcome of the treatment group, for observations near the cut-off point. Since a positive effect for the treatment group over the control group gives a negative value to the Wald estimator, I multiply it by -1 in order to capture the positive effect with a positive coefficient. Therefore, equation 3 is modified as follows:

$$\theta_{Wald} = E[Y_i(1) - Y_i(0) | Z_i = \bar{Z}] \tag{4}$$

In order to use a regression discontinuity design, I need two conditions (Lee and Lemieux, 2010). First, the treatment must be randomly assigned conditional on observables (unconfoundedness assumption) and the individuals cannot manipulate the assignment variable. Second, as I cannot observe the same individual with or without treatment, then to observe the treatment effect, two individuals around the cut-off point that are arbitrarily close to each other are compared. Since I am simulating the elections with given results, no candidate can neither manipulate the amount of votes obtained in the election nor change from treatment to control group.

To satisfy the second condition, I compare senators whose share of votes are within a bandwidth h around the cut-off point. In this case, the cut-off point is the minimum share of votes that a senator would have need to get a seat in the simulation (threshold $\bar{Z}$). In doing so, I compare senators that would have been barely elected in the simulation with senators that would have lost, but were near to be elected, as they obtained almost the same share of votes. Table 3 shows a set of control variables. Panel A presents some personal characteristics of senators by treatment group; while panel B, some political characteristics. The last column of the table shows the t-test of mean differences.

Table 3 shows that there are few characteristics whose difference in means is significant. Senators from the treatment group were born in different Departments than senators from the control group, particularly, there are more that were born in Casanare, in Putumayo, and in San Andrés. In addition, there are more senators in the treatment group that belong to political party *ALAS*, while there are more senators in the control group that belong to the Conservative party. Additionally, more senators from the control group were part of the fourth commission in the Senate. Finally, more senators from the treatment group change to a coalition party in 2009. Since only 7 out of 56 characteristics are significant, I am comparing senators who belong to treatment and control groups that are similar to each other, satisfying the second condition. Nonetheless, I control the regressions for these characteristics.

Finally, since the optimal bandwidth h following Imbens and Kalyanaraman (2012) is calculated as:

$$h^* = argmin_h MSE(h)$$

where MSE is the mean squared error then, each one of the three outcome variables has a different optimal bandwidth, because there is not information for all the observations on each outcome.[7] I decide to use two different values ($h = 0.15$ and $h = 0.20$) which satisfy the assumption of comparing individuals really near the threshold and are close to the optimal bandwidth values calculated for each of the three outcomes. Since the running variable is the (normalized) share of votes, I am comparing at most two senators whose difference in the share of votes is not larger than 0.4 percentage points. This distance allows us to be close to the threshold and, at the same time, to have a fair number of congressmen in the treatment group.

3.3 Data

I use two main databases. On the one hand, there is the electoral data that comes from the Center of Economic Development Studies (CEDE) from Universidad de los Andes and from the *Registraduría Nacional* (the Colombian Electoral Agency). This dataset is at the candidate level by municipality and contains the corporation the candidate is running for, its party and the votes it obtained, among other information. Pachón y Sánchez (2014) makes a more detailed explanation of the database.

On the other hand, there is the congressmen dataset that comes from *Congreso Visible*, from Universidad de los Andes's Department of Political Science.[8] This data contains information at the candidate level about their congressional activity such as their political career, the amount of law drafts presented by each of them during each term, an index of political discipline and the number of voting sessions they attend to during each term, as well as some personal information such as their age, place of birth, schooling level, and their professional trajectory.

The index of political discipline is a partisan agreement index developed by *Congreso Visible* which is elaborated based on the debate's roll-call votes. To compute the index they take the number of times a senator votes like the majority of his party, or as the party indicates, and divide it by the number of times the senator votes. The result is and index ranging between zero and one, where one means that the senator has been fully disciplined; and zero, the opposite.

4 Results

4.1 Main results

On the one hand, there are the results of the non-parametric estimations. Table 4 shows the Wald estimator for the three outcomes (each one in one column) for a bandwidth of $h = 0.20$ (*lwal*) and the 75 percent ($h = 0.15$), the 125 percent ($h = 0.25$), and the 150 percent ($h = 0.30$) of that value. Column one (1) presents the results for the number of law draft presented during the 4-year term; column two (2), for the discipline index; while column three (3) for the attendance to voting sessions. For the number of law draft presented, there is a positive effect although it is not significant, while for the discipline index and the attendance to voting sessions there is also a positive and significant effect.

On the other hand, table 5 shows the parametric results. Panel A shows the results for law drafts; panel B, for the discipline index; while panel C, for the attendance outcome. Columns one (1) to three (3) show the result using all the observations and polynomial regressions of first, second, and third order, respectively. Columns four (4) to six (6) show the results using as bandwidth $h = 0.15$ and polynomial regressions of first, second, and third order; while the last three columns use as bandwidth

[7] Following Imbens and Kalyanaraman (2012) methodology, the optimal bandwidths for law drafts, the discipline index, and the attendance variables respectively are 0.11, 0.13, and 0.17.

[8] Thanks to Laura Wills, director of *Congreso Visible*, for her help with this dataset.

$h = 0.20$ and polynomial regressions of first, second, and third order, repectively. The last row of the table reports the value of the bandwidth used. When no bandwidth is reported, all observations are used.

For the case of number of law drafts presented by the senators during the 4-year term (panel A), there is a positive effect of the treatment in both parametric and non-parametric results, although it is not significant. This means that the senators that would have lost, but were near to be elected in the simulation, present more law drafts during the 4-year term when compared with the senators that would have been barely elected in the simulation (but not significant).

For the discipline index (panel B), there is also a positive effect of the treatment in both parametric and non-parametric results. Even though not all the specification are significant, the magnitude of the coefficients is robust around 0.120 percentage points, which means that the senators that would have lost, but were near to be elected in the simulation, are on average 20 percent more disciplined with respect to the senators that would have been barely elected in the simulation.

Finally, for the attendance to voting sessions (panel C), there is a positive effect of the treatment in both parametric and non-parametric results; However, the magnitude of the coefficients is larger in the parametric results. Also, not all the specifications are significant but there is no change in the direction of the effect and the coefficients are not robust around a particular value. In the lowest estimation, the senator that would have lost, but were near to be elected in the simulation, attend on average to 40 percent more voting sessions that the senators that would have been barely elected.

However, there were differences in the attendance to voting session among the two groups of senators, as shown in table 2. There is a significant difference between the senators that would have lost, but were near to be elected in the simulation, with respect to the one that would have been barely elected. On average, the senators that would have lost attend to 185 more voting sessions. Taking into account this difference, the magnitude of the effect is reduced but it is still positive. The lowest estimation of the effect is to attend on average to 4 percent more voting sessions, with respect to the senators that would have been barely elected.

4.2 Further results

These results suggests that, the senators that would have lost, but were near to be elected when simulating the 2006 Senate elections using Hare quota as the assignment mechanism, present more law drafts (although not significant), are about 20% more disciplined, and attend to at least to 4% more voting sessions with respect to the senators that would have been barely elected. Yet, these results cannot be interpreted as being a better senator or a better politician.

A possible explanation for the difference in the legislative behavior of the senators could be that the senators are seeking an electoral return in the subsequent election. As mentioned, the senators that belong to the treatment group are the ones who obtained fewer share of votes then, they may display this behavior in order to increase their share of votes in the subsequent election or their probability of being (re)elected.

Using the same methodology as before, I explore the effect on the probability of being elected in 2010 (table 7) and the effect on their share of votes in 2010 (table 8). The probability of being elected in 2010 is a dummy variable that takes the value of one if the senator is elected again in 2010 and zero if the senator is not elected in 2010. The share of votes is calculated dividing the votes the senator-candidate obtain in 2010 Senate election by the total number of valid votes in the 2010 Senate election.

Hereafter, I use only the senators that run for 2010 Senate election, i.e. the ones who are seeking reelection. Table 6 summarizes, for the two groups of senators, how many run in 2010 Senate elec-

tion. There are 49 senators (out of 98) that decide to run in 2010 Senate election, 31 belong to the control group (the ones would have been elected in the simulation using 2006 results) while 18 belong to the treatment group (the ones would not have been elected in the simulation using 2006 results).

Since I am using only 49 observations, imposing a bandwidth will decrease the sample size; therefore, I use all the 49 observations in the RDD with polynomial of first, second, and third order. To control for possible differences, as I am not comparing the senators just around the threshold, I include personal characteristics, such as age, gender, place of birth, and education. I also control for political characteristics, such as experience in the Senate or in Congress, the party they belong to, the commission the senator belong to in 2006 term, and a dummy variable that takes the value of 1 if the senator did not finished the 4-years, term.[9] Then, tables 7 and 8 show in the first three columns a polynomial regression of first order. The first column include all the observations and no controls, the second column include personal controls, while the third column controls for political characteristics. The next three columns (4 to 6) do the same but for a polynomial of second order, while the last three columns (7 to 9) uses a polynomial of third order.

As it can be seen in table 7, there is no differential probability of being elected in 2010. The coefficient is not robust nor the direction of the effect. Using a first order polynomial, the effect is significant at 10%, but the significance, magnitude, and direction of the effect is changed when included personal and political characteristics. The estimations using a second order polynomial show a negative effect, but not significant; while, the estimations using a third order polynomial show a positive but not significant effect when personal or no characteristics are used, however, when I control for political characteristics, the coefficient shows a negative effect, but again not significant.

On the other hand, table 8 shows the effect on the share of votes in 2010 Senate election. As in the previous case, there are non-robust results and they suggest that there is not a differential change in the share of votes of the two groups. None of the first order polynomial estimations is significant but the direction of the effect change from being positive (when personal or no characteristics controls are used) to being negative when controlling for political and personal characteristics. The estimations of the second order polynomial show a negative and significant effect on the share of votes, although the significance is lost when controlling for personal and political characteristics. Finally, the estimations for the third order polynomial show a negative and significant (at 10%) coefficient, but the direction and magnitude of the effect is changed when controlling for personal characteristics (the significance of the effect remains at 10%). When controlling for political characteristics the direction, magnitude, and significance of the effect changes again, showing a non-robust effect.

Since these results are comparing the share of votes of all the candidates, not having into account the party they belong to, then table 9 explore the possibility of senators improving their share of votes within their party list. As the last candidate elected from a party list (who belong to the treatment group) can be the 10th candidate elected from a big party, while being the 5th if elected from a small party. For that, I calculate the share of votes each candidate got dividing the number of votes by the total votes the party get.

Table 9 shows the results of this possibility. As in the previous cases, the results suggests that there is not a differential change in the share of votes within the party list. The first order polynomial estimations show a positive but not significant effect, when no controls are used and when controlling for personal characteristics, however when controlling for political characteristics, the direction of the effect change to being negative. None of the coefficients of the estimations using a second order polynomial is significant, and the direction of the effect changes from negative to positive when personal characteristics are included, and again changes to negative when controlling for political characteris-

[9] Table 3 show the descriptive statistics.

tics. The estimations using a third order polynomial present a negative and significant effect (at 1%), however when controlling for personal characteristics the significance is lost and the magnitude and direction change. The direction of the effect changes again to negative (non-significant) when political characteristics are included showing a non-robust effect.

Another possible explanation is that, while the share of votes seems not to have a difference, the concentration of votes could differ from one group to another.[10] A candidate could decide to focus his campaign in only one region, while other candidate could decide to do his campaign nationwide. Rodríguez-Raga (2001) shows for 1991, 1994 and 1998 Senate election that the candidates has no preference over concentrate their votes or not, even though he found that the candidates whose votes are more concentrated are slightly more successful in terms of getting a seat.

In order to measure the concentration of votes, I calculate the inverse of the Herfindahl index at the departmental level for each senator-candidate using the results of 2010 Senate election.[11] This concentration index ranges from one to thirty three, where 1 means their votes are highly concentrated or that the candidate obtained all of their votes in one Department and 33 means their votes are equally distributed between the 33 Departments.

Table 10 show the results when using the same methodology as before. They suggest that there is no difference in the concentration of votes between the two groups of candidates. Neither the magnitude nor the direction of the effect is robust to the specifications. The estimates show, for the first, second, and third order polynomial, a negative effect on the concentration index, when using no controls or when controlling for personal characteristics, but none of them being significant. For the first, second and third order polynomial estimations show a positive effect, although not significant, when controlling for personal and political characteristics.

Finally, the relation between various politicians and paramilitary groups marked the 2006 Senate term (Acemoglu, Robinson, and Santos, 2013) and the reelection rate for the subsequent election. A consequence of this relation was that 35 percent of the senators elected in 2006 resigned their seat before the term 4-year term finished. According to Duque (2011), only 44 out of 102 senators were reelected in 2010 (43%). This reelection rate is lower than the reelection rate of previous Senate elections, were more than 50 percent of the senators were reelected. Moreover, according to Cárdenas, Junguito, and Pachón (2006) the reelection rate in the Senate have had a positive trend in Colombia since 1935, reaching a peak in 1986, when the reelection rate was more than 60%.[12]

Since the proportion of senators seeking reelection diminished with respect to previous elections, our results can be biased, as they are not taking into account all of the senators that would have run for reelection. Then, I check for differences in the probability of being investigated for links with paramilitary groups only for the senators who seek reelection in 2010. The probability of being investigated uses a dummy variable that takes the value of one if the senator was investigated for links with paramilitary groups during the term, and zero otherwise. Table 11 shows the results of the probability of being investigated of the senators that would have lost in the simulation, with respect to the senators

[10] Rodríguez-Raga (2001) point out the concentration of votes as one of the two dimensions of the electoral strategies.

[11] The inverse of the Herfindahl Index can be expressed as:

$$CI_i = \frac{1}{\sum_{d=1}^{33} s_{d,i}^2}$$

where CI_i is the concentration index for candidate i and $s_{d,i}$ is the share of votes candidate i obtained in the Department d. There are 33 Departments: one for each of the 32 Departments of Colombia and 1 for Bogotá, the capital city.

[12] Cárdenas, Junguito, and Pachón present data from 1935 to 1998. The reelection rate increase steadily from around 10% in 1935 to more than 60% in 1986. Then, after 1991 Constitution the reelection rates decreased but were higher than 40% and increased over 50% for 1998 Senate election.

that would have been elected anyways.

As it can be seen in table 11, the results suggests that there is no differential probability of being investigated, then the senators that would have lost in the simulation are not more likely of being investigated when compared to the senators that would have been elected anyways. The estimates show a negative effect although not significant for the first order, second and third order polynomial. The negative effect is robust when personal characteristics are included, and when political characteristics are included as well. Then, any group of senators is more likely of being investigated, thus I have not a selection bias on the sample I am using.

5 Final comments

It is not easy to measure the legislative behavior of senators; however, the political reform of 2003 creates a unique scenario as it modified the assignment mechanism while keeping the number of public offices to be provided. I take advantage of this change in the rule simulating the 2006 Senate election using the actual voting but instead of using D'Hondt formula as the assignment mechanism, I use the mechanism used before the reform took place, namely the Hare coefficient and largest remainders.

I use a Regression Discontinuity Design to compare the legislative behavior of the senators that would have lost in the simulation versus the senators that would have been elected anyways. I use as proxy three different measures: the amount of law drafts presented during the 4-year term, a discipline index, and the attendance to voting sessions. I find that the senators that would have lost in the simulation present more law drafts, although it is not significant the effect, are 20% more disciplined, and attend to at least 4% more voting sessions.

Since this behavior cannot be described as being better politician or as having better behavior, I explore the possibility of differences in the electoral returns of these two groups of senators in the subsequent election. I find that there are no differences in the probability of being (re)elected in 2010, in the share of votes, in the share of votes within their party list, and in the concentration of votes. Also, since 2006 term was marked for links between senators and paramilitary groups, and 35% of the senators did not finish the 4-year term, I explore the possibility of differential probabilities of being investigated. Yet I find that neither group of senators is more likely to be investigated.

However, for instance, Plata (2011) found a positive and significant effect of the law drafts presented and approved over the reelection, although he uses data from the House of Representatives. Hoskin et al. (2011) and Cárdenas, Junguito, and Pachón (2006), on the other hand, argue that the most important law drafts are presented by the executive, making the Congress loses its importance in terms of law drafts presented.

In terms of reelection, Redmon and Regan (2015) use a regression discontinuity design to show the effect of the incumbency in the probability that a candidate in Ireland's lower house of parliament wins a seat in the next election. Ireland's electoral system is a proportional representation with a single transferable vote and, also, multiple incumbents could run for reelection. They found an increase in the probability of 18 percentage points.

Although, there are studies that suggest that the probability of reelection is due to other reasons different to the legislative behavior or incumbency. For instance, Carey and Shugart (1995) suggest that the Colombian electoral system can be consider as a personal-list system; therefore, a candidate is elected independently of his legislative behavior or whether he is incumbent or not. Hoskin et al. (2011) provide an explanation to this idea; they found that parties are decentralized and the congressional representatives are region oriented, as they serve as the link between their region and the

institutions in Bogotá.

Nonetheless, the political reform of 2003 played an important role in the electoral system. For example, one of the objectives of the political reform was to diminish the amount of parties in power in order to improve governability and to strength the political parties (Battle and Puyana, 2013). Giraldo and López (2006) presents some positive effects of the reform on the electoral and political party system, such as strengthen the parties in power.

I cannot compare the effects showed by Giraldo and López as they are taking parties as the unit of analysis while I am taking candidates. It is out of the scope of this work to look at the effects at the party level, although it will complement the present work to look the results at the party level as the results at the individual level seems not to be capturing the difference in legislative behavior.

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Table 1: Candidates running in 2006 Senate election

		Simulation 2006		
		not elected	elected	Total
Election 2006	not elected	697	24	721
	elected	22	76	98
	Total	719	100	819

Table 2: Main variables

	Control			Treatment			ttest
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev	diff
Panel A: Running variable							
Share of votes	76	0.633	0.2931	22	0.327	0.0364	0.3060***
Normalized share of votes	76	0.227	0.2931	22	-0.078	0.0364	0.3060***
Panel B: Outcome variables							
Law drafts presented	75	16.387	12.838	22	19.5	8.8304	-3.1133
Discipline index	72	0.6164	0.1265	20	0.627	0.1104	-0.0112
Attendance to voting sessions	72	281.5	257.37	20	466.9	203.99	-185.37***

Table 3: Control variables

	Control			Treatment			ttest
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	diff
Panel A: Personal characteristics							
Years of schooling	73	16,73	1,3669	21	17,05	0,8047	-0,3216
Female	75	0,1200	0,3271	22	0,0909	0,2942	0,0291
Age	70	50,16	9,1946	20	53,10	8,7654	-2,9429
Birth Department							
Born abroad	75	0,0133	0,1155	22	0	0	0,0133
Antioquia	75	0,1200	0,3271	22	0,0909	0,2942	0,0291
Atlantico	75	0,1067	0,3108	22	0,0909	0,2942	0,0158
Bogotá	75	0,0933	0,2929	22	0,1364	0,3513	-0,0430
Cundinamarca	75	0,0133	0,1155	22	0	0	0,0133
Santander	75	0,0933	0,2929	22	0,0455	0,2132	0,0479
Bolivar	75	0,0400	0,1973	22	0,0455	0,2132	-0,0055
Boyacá	75	0,0400	0,1973	22	0,0455	0,2132	-0,0055
Tolima	75	0,0400	0,1973	22	0,0455	0,2132	-0,0055
Caldas	75	0,0400	0,1973	22	0	0	0,0400
Córdoba	75	0,0800	0,2731	22	0	0	0,0800
Magdalena	75	0,0133	0,1155	22	0,0455	0,2132	-0,0321
Nariño	75	0,0267	0,1622	22	0,0455	0,2132	-0,0188
Norte de Santander	75	0,0533	0,2262	22	0	0	0,0533
Cauca	75	0,0400	0,1973	22	0,0909	0,2942	-0,0509
Huila	75	0,0267	0,1622	22	0	0	0,0267
Risaralda	75	0,0267	0,1622	22	0	0	0,0267
Meta	75	0,0133	0,1155	22	0	0	0,0133
Quindío	75	0,0133	0,1155	22	0,0455	0,2132	-0,0321
Sucre	75	0,0400	0,1973	22	0,0455	0,2132	-0,0055
Valle del Cauca	75	0,0533	0,2262	22	0,0455	0,2132	0,0079
Casanare	75	0	0	22	0,0455	0,2132	-0,0455*
La Guajira	75	0,0133	0,1155	22	0,0455	0,2132	-0,0321
Putumayo	75	0	0	22	0,0455	0,2132	-0,0455*
San Andrés	75	0	0	22	0,0455	0,2132	-0,0455*
Panel B: Political characteristics							
Political experience							
Senate candidate in 2002	76	0,6842	0,4679	22	0,5455	0,5096	0,1388
Representative in 2002	76	0,2500	0,4359	22	0,2727	0,4558	-0,0227
Senator in 2002	76	0,5395	0,5018	22	0,3636	0,4924	0,1758
Representative in 1998	76	0,2632	0,4433	22	0,2273	0,4289	0,0359
Senator in 1998	76	0,3158	0,4679	22	0,3182	0,4767	-0,0024
Experience in Senate	76	0,5658	0,4989	22	0,4545	0,5096	0,1112
Experience in House of Representatives	76	0,8158	0,3902	22	0,7273	0,4558	0,0885
Terms in Congress since 1998	75	2,3467	0,7968	22	2,0909	0,8679	0,2558
Political party							
Conservative	75	0,2267	0,4215	22	0	0	0,2267**
Liberal	75	0,2000	0,4027	22	0,1364	0,3513	0,0636
Partido de la U	75	0,1867	0,3923	22	0,2727	0,4558	-0,0861
Cambio Radical	75	0,1333	0,3422	22	0,2273	0,4289	-0,0939
Polo	75	0,0933	0,2929	22	0,1364	0,3513	-0,0430
Convergencia ciudadana	75	0,0667	0,2511	22	0,0909	0,2942	-0,0242
ALAS	75	0,0133	0,1155	22	0,1364	0,3513	-0,1230**
Colombia Democrat́ica	75	0,0400	0,1973	22	0	0	0,0400
Colombia Viva	75	0,0267	0,1622	22	0	0	0,0267
Characteristics during 2006 term							
Not finished the 4-years term	76	0,4211	0,4970	22	0,0909	0,2942	0,3301
President of Commission	76	0,0526	0,2248	22	0	0	0,0526
Change party in 2009	76	0,0395	0,1960	22	0,0909	0,2942	-0,0514
Change to coalition party in 2009	76	0,0132	0,1147	22	0,0909	0,2942	-0,0778*
First Committee in 2006	75	0,2133	0,4124	22	0,1818	0,3948	0,0315
Sencond Committee in 2006	75	0,1200	0,3271	22	0,0909	0,2942	0,0291
Third Committee in 2006	75	0,1333	0,3422	22	0,2273	0,4289	-0,0939
Fourth Committee in 2006	75	0,1200	0,3271	22	0,1818	0,3948	-0,0618
Fifthe Committee in 2006	75	0,1467	0,3562	22	0	0	0,1467*
Sixth Committee in 2006	75	0,1200	0,3271	22	0,1818	0,3948	-0,0618
Seventh Committee in 2006	75	0,1467	0,3562	22	0,1364	0,3513	0,0103

Table 4: Non-parametric results

	Law Drafts Presented (1)	Discipline Index (2)	Attendance Voting Sessions (3)
lwald	2.405	0.120*	199.7*
	(5.251)	(0.0693)	(107.5)
lwald75	2.774	0.118	188.1
	(5.889)	(0.0803)	(115.0)
lwald125	3.364	0.123*	203.3*
	(5.114)	(0.0641)	(104.7)
lwald150	4.302	0.123**	205.2**
	(4.972)	(0.0590)	(101.0)
Observations	97	92	92
Optimal Bandwidth	0.200	0.200	0.200

The first row show the results of the Wald estimator using $h = 0.20$ as bandwidth. The second row show the results for $h = 0.15$; the third row, for $h = 0.25$; and the fourth row for $h = 0.30$. All regressions are controlled by variables whose difference in means is significant. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 5: Parametric results

	(1) 1st order	(2) 2nd order	(3) 3rd order	(4) 1st order	(5) 2nd order	(6) 3nd order	(7) 1st order	(8) 2nd order	(9) 3nd order
Panel A: Law Drafts Presented									
Benefiting from the reform	7.646*	12.47	2.754	2.009	4.546	-3.589	2.030	5.559	-3.457
	(4.244)	(7.908)	(12.12)	(5.096)	(8.953)	(13.41)	(4.871)	(8.648)	(13.10)
Constant	15.63***	15.36***	17.77***	21.27***	23.28***	24.11***	21.25***	22.27***	23.98***
	(1.555)	(2.509)	(2.715)	(3.163)	(4.673)	(5.757)	(2.808)	(4.143)	(5.238)
Observations	97	97	97	63	63	63	71	71	71
R-squared	0.021	0.023	0.048	0.112	0.125	0.132	0.156	0.162	0.173
Panel B: Discipline Index									
Benefiting from the reform	0.103***	0.103	-0.00859	0.115*	0.123	-0.0180	0.125**	0.115	-0.0264
	(0.0359)	(0.0788)	(0.0841)	(0.0648)	(0.120)	(0.136)	(0.0583)	(0.110)	(0.129)
Constant	0.616***	0.617***	0.581***	0.603***	0.597***	0.591***	0.593***	0.605***	0.599***
	(0.0198)	(0.0300)	(0.0394)	(0.0573)	(0.0939)	(0.113)	(0.0500)	(0.0810)	(0.104)
Observations	92	92	92	60	60	60	68	68	68
R-squared	0.025	0.025	0.079	0.041	0.042	0.056	0.039	0.041	0.055
Panel C: Attendance to Voting Sessions									
Benefiting from the reform	277.7***	214.8	363.6**	199.1*	162.3	426.8**	204.1*	164.4	353.7*
	(85.85)	(151.3)	(179.5)	(110.9)	(177.3)	(209.4)	(106.0)	(171.7)	(200.9)
Constant	314.4***	326.3***	360.3***	393.0***	378.8***	297.0**	388.0***	376.7***	370.2***
	(35.51)	(48.74)	(60.87)	(77.75)	(100.7)	(117.6)	(70.87)	(91.97)	(104.3)
Observations	92	92	92	60	60	60	68	68	68
R-squared	0.122	0.124	0.136	0.124	0.125	0.148	0.116	0.118	0.123
Bandwidth				0.150	0.150	0.150	0.200	0.200	0.200

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 6: Senators running in subsequent election

		Simulation 2006		
		not elected	elected	Total
Election 2010	not elected	5	6	11
	elected	13	25	38
	Total	18	31	49

Table 7: Probability of (re)election in 2010 Senate election

VARIABLES	(1) 1st order	(2) 1st order	(3) 1st order	(4) 2nd order	(5) 2nd order	(6) 2nd order	(7) 3nd order	(8) 3nd order	(9) 3nd order
Benefiting from the reform	0.383*	-0.0287	-0.0293	-0.366	-0.880	-0.0293	0.0671	1.722	-0.0293
	(0.205)	(0.437)	(0)	(0.293)	(1.107)	(0)	(0.260)	(1.367)	(0)
Constant	0.853***	3.874	5.170	1.047***	4.563	5.170	1.130***	6.502**	5.170
	(0.0887)	(2.417)	(0)	(0.0847)	(2.621)	(0)	(0.0949)	(2.822)	(0)
Observations	49	44	44	49	44	44	49	44	44
R-squared	0.131	0.443	1.000	0.233	0.507	1.000	0.262	0.564	1.000
Personal controls		✓	✓		✓	✓		✓	✓
Political controls			✓			✓			✓

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8: Share of votes in 2010 Senate election

VARIABLES	(1) 1st order	(2) 1st order	(3) 1st order	(4) 2nd order	(5) 2nd order	(6) 2nd order	(7) 3nd order	(8) 3nd order	(9) 3nd order
Benefiting from the reform	0.108	0.0862	-0.332	-0.215**	-0.141	-0.332	-0.216*	1.214*	-0.332
	(0.0801)	(0.199)	(0)	(0.105)	(0.478)	(0)	(0.123)	(0.575)	(0)
Constant	0.374***	1.949	-2.290	0.530***	2.629	-2.290	0.582***	3.950**	-2.290
	(0.0627)	(1.537)	(0)	(0.0706)	(1.556)	(0)	(0.0937)	(1.684)	(0)
Observations	49	44	44	49	44	44	49	44	44
R-squared	0.442	0.698	1.000	0.543	0.759	1.000	0.551	0.797	1.000
Personal controls		✓	✓		✓	✓		✓	✓
Political controls			✓			✓			✓

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9: Share of votes on the party list in 2010 Senate election

VARIABLES	(1) 1st order	(2) 1st order	(3) 1st order	(4) 2nd order	(5) 2nd order	(6) 2nd order	(7) 3nd order	(8) 3nd order	(9) 3nd order
Benefiting from the reform	0.301	0.575	-2.149	-2.475	0.458	-2.149	-6.397***	8.348	-2.149
	(1.287)	(2.047)	(0)	(1.710)	(3.659)	(0)	(2.204)	(4.782)	(0)
Constant	2.886***	20.25	-12.85	3.943***	29.43*	-12.85	6.153***	34.25**	-12.85
	(0.924)	(15.38)	(0)	(1.232)	(15.03)	(0)	(1.733)	(14.96)	(0)
Observations	49	44	44	49	44	44	49	44	44
R-squared	0.094	0.854	1.000	0.134	0.918	1.000	0.244	0.927	1.000
Personal controls		✓	✓		✓	✓		✓	✓
Political controls			✓			✓			✓

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 10: Concentration index of the share of votes in 2010 Senate election

VARIABLES	(1) 1st order	(2) 1st order	(3) 1st order	(4) 2nd order	(5) 2nd order	(6) 2nd order	(7) 3nd order	(8) 3nd order	(9) 3nd order
Benefiting from the reform	-1.838	-5.084	0.0949	-3.397	-0.113	0.0949	-5.156	-1.050	0.0949
	(1.655)	(3.733)	(0)	(2.130)	(3.728)	(0)	(3.140)	(10.25)	(0)
Constant	4.523***	3.742	63.06	5.197***	7.912	63.06	5.980***	4.313	63.06
	(0.957)	(25.13)	(0)	(1.527)	(21.77)	(0)	(2.134)	(24.49)	(0)
Observations	49	44	44	49	44	44	49	44	44
R-squared	0.052	0.685	1.000	0.071	0.709	1.000	0.090	0.717	1.000
Personal controls		✓	✓		✓	✓		✓	✓
Political controls			✓			✓			✓

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 11: Probability of being investigated for links with paramilitary groups

VARIABLES	(1) 1st order	(2) 1st order	(3) 1st order	(4) 2nd order	(5) 2nd order	(6) 2nd order	(7) 3nd order	(8) 3nd order	(9) 3nd order
Benefiting from the reform	-0.0962	-0.0163	-0.643	-0.270	-0.124	-0.643	-0.186	-0.883	-0.643
	(0.201)	(0.478)	(0)	(0.205)	(1.094)	(0)	(0.263)	(2.119)	(0)
Constant	0.244*	1.559	-8.189	0.349**	1.842	-8.189	-1.20e-05	3.238	-8.189
	(0.133)	(4.118)	(0)	(0.164)	(4.369)	(0)	(0.174)	(4.924)	(0)
Observations	49	44	44	49	44	44	49	44	44
R-squared	0.069	0.393	1.000	0.089	0.398	1.000	0.262	0.611	1.000
Personal controls		✓	✓		✓	✓		✓	✓
Political controls			✓			✓			✓

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 1: Number of parties and lists in Senate elections

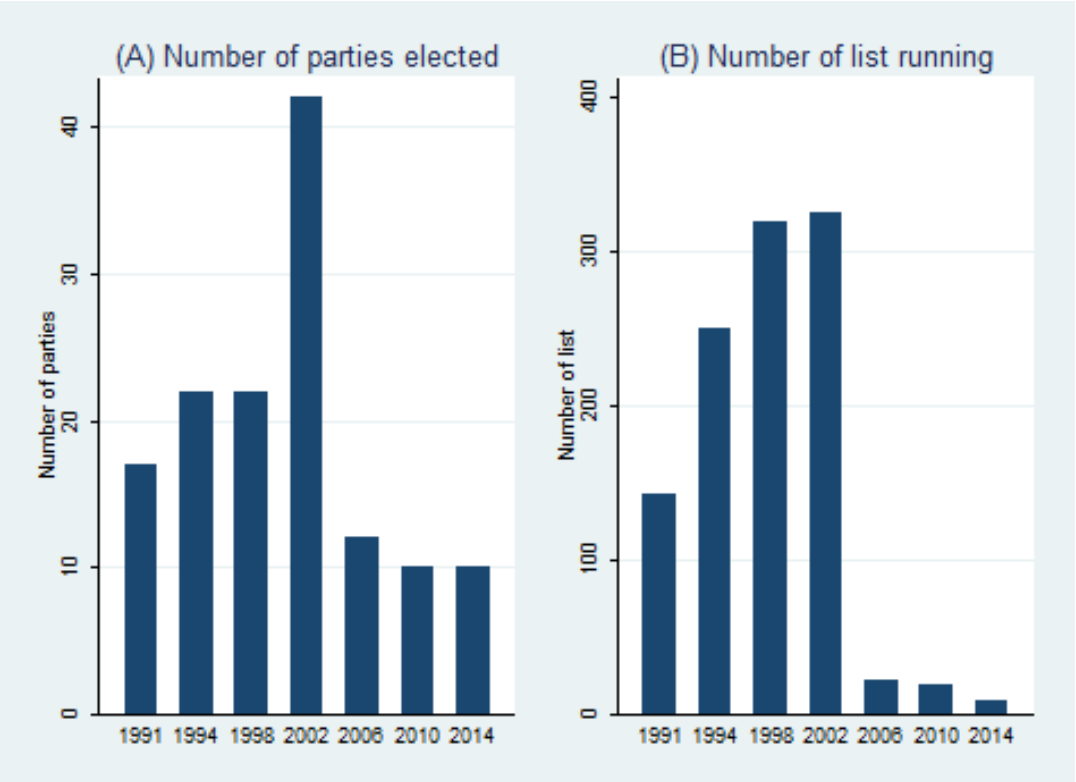


Figure 2: Scenario

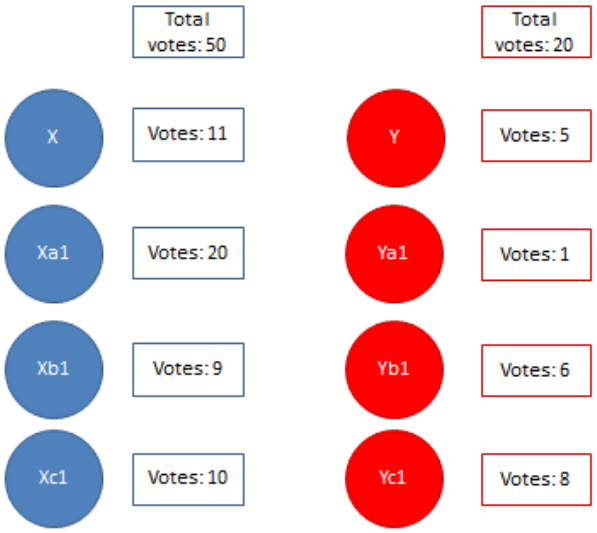


Figure 3: Scenario: Hare quota

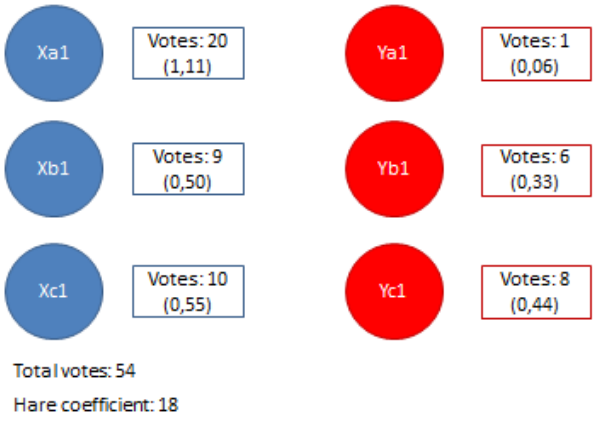
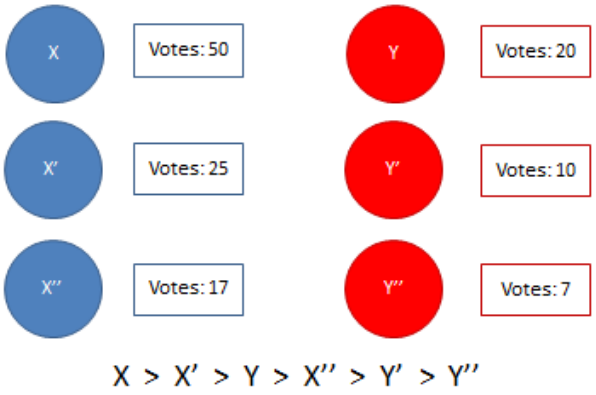


Figure 4: Scenario: D'Hondt method



A Appendix: Assignment mechanism

The change in the assignment mechanism introduced by the reform gives us a natural experiment from which we can have different groups of candidates. Particularly, there are some candidates that were elected in the congressional election after the reform, but would have not had the reform not been made; there is another group of candidates that would have been elected anyways, and a last group made up of the candidates who did not get a seat in the election after the reform, whether they would have been elected or not using the previous mechanism. To best describe this situation, we set up a scenario to explain both assignment mechanisms and to show which are the candidates that were benefited from the reform.[13]

Suppose there are 2 political parties, X and Y, running in the congressional election. Each of these parties have three lists labeled a, b, and c, where each list has a finite number of candidates, numbered from 1 to n, and the order of the candidates matters. The candidate 1, from the list a, and party X is noted Xa1. Also assume that there are 3 public offices to be assigned, i.e. three seats in the Congress.

In the assignment mechanism used previous to the reform, citizens vote for a list and the candidate head of the list is the one who gets the seat if the list is assigned with one. In the case the list gets more than one seat, the order of the candidates within the list matters to the assignment; therefore, a second seat will go to the candidate placed second in the list. The lists and candidates are members of a given party but the party itself plays no more roles.

In the assignment mechanism post reform each party is allowed to present at most as many candidates as public offices they are running for in one list. The order of the candidates within the list do not matters as the citizens can vote either for the party or for a given candidate. If the list is assigned with a seat, it goes to the candidate who gets more votes. In the case that more than one seat is assigned to the list, they are assigned to the candidates who have more votes within the list.

Finally, assume that figure 2 present the results of the election held after the reform. The two upper circles (labeled X and Y) represent the votes for the list of each party, while the six circles below them represent the candidates within each list. In the top there is the total amount of votes each party gets. Party X gets in total 50 votes: 11 votes were to the list, 20 to the candidate Xa1, 9 to Xb1 and 10 to Xc1. Correspondingly, party B gets 20 votes: 5 for the list, 1 for the candidate Ya1, Yb1 obtained 6 votes, while Yc1, 8 votes.

Hare Quota

Using this set up, we expose the assignment mechanism used previous to the reform. It uses the Hare quota and the largest remainders method, and it is a party-list proportional representation system. Since under this mechanism the parties do not play a role, then the votes assigned to the party list are ruled out and we keep the results of each individual list. Figure 3 shows this case where the two upper circles from the previous figure do not take place anymore.

The first step is to calculate the total votes of the election, by adding up the votes each list get. After that, the hare coefficient is calculated dividing the total votes by the number of public offices to be provided. In our scenario, the sum of the votes is 54 and the Hare coefficient or quota is 18, as the number of seats to be assigned is 3. Then, all of the lists that surpass the quota are assigned with a seat, making list Xa1 the only list satisfying this condition.

The second step is to divide the votes each list gets by the quota. The results are shown in figure

[13] We briefly expose here both assignment mechanisms. For further details and examples, we suggest see Róbles (2005).

3 in parentheses below the votes the list obtained. Next, the remainders of the coefficients are sorted from the highest to the lowest, including all lists. The seats left to be assigned are allocated to the lists with the largest remainders. In our scenario, since there are two remaining seats, the seats go to lists Xc1 and Xb1, making the three lists of party X the ones who get the seats.

D'Hondt Method

After the reform, the assignment mechanism uses the D'Hont method which is a highest averages method for allocating seats in party-list proportional representation. Under this mechanism, as the party has a unique list, the seats are allocated to parties in proportion of votes received. The list can be a closed list or an open list: in the former, the party selects the order of election of their candidates, as it matters, while in the latter the order is determined by the votes each candidate obtained.

The first step is calculate successive quotients dividing the total number of votes each party received by successive natural numbers, beginning in 1 up to the total of public offices to be provided (3 in our set up). The two upper circles in figure 4, labeled X and Y, show the total number of votes the each party received divided by one; the next two, divided by two, labeled X' and Y'; while the two circles beneath, labeled X" and Y", represent the total number of votes each party received divided by three.

Then, there are 6 lists as X', X", Y', and Y" each represents a new list. The lists with the three highest totals of votes are the ones who get the seats. In our scenario, the order is $X > X' > Y > X'' > Y' > Y''$, therefore two seats go to party X while the other seat goes to party Y. Since in our set up the lists are open list, the order is determined by the votes each candidate gets. For party X the order is Xa1, Xc1, Xb1, then the seats go to candidates Xa1 and Xc1. The last seat goes to candidate Yc1 from party Y, as the order is Yc1, Yb1, Ya1.

There are two main conclusions derived from the change in the assignment mechanism. First, under D'Hondt method (after the reform), two parties were assigned with seats while under Hare quota (before the reform) only one party gets all the seats. Second, candidate Yc1 is benefited from the reform, as it is elected under D'Hondt method system but would have not been elected under Hare quota.

As said before, when we simulate 2006 congressional elections using 2002 rule we can identify three groups of candidates. The first group is made up by candidates who did not get a seat in 2006. The second group is made up by candidates who were elected in 2006 but would have not using 2002 rule. Finally, the third group is made up by congressmen that would have been elected anyways, independently of the mechanism used. Particularly, the last two groups are of interest.