Understanding electoral system changes

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Abstract

This article addresses a recurrent yet unanswered question in electoral studies: to which extent electoral system changes account for significant variations in parliamentary fragmentation? The existing literature has explained how different types of electoral systems may form different types of party equilibria. The literature has also explained why different electoral arrangements were chosen at particular point in time. These explanations use the strategic behaviour of key political actors to explain changes of electoral systems. At the bottom of those explanations rest the assumption that modifying the rules of the game sought to alter the existing distribution of seats among parties. In this article, I investigate under which conditions electoral system changes have a significant impact on altering the existing parliamentary fragmentation. I argue that one should expect a significant change in the effective number of parliamentary parties only when electoral institutional changes are large. In particular, when the number of districts, seats and formula change simultaneously and significantly compared to the previous election. Furthermore, changes are absorbed by voters and parties immediately and no duvergerian psychological effect is observed in succeeding elections. I find empirical confirmation for this claim after analyzing 483 parliamentary elections in 71 countries between 1945 and 2000.

Introduction

Some democracies, particularly new ones, have been characterized by producing rather unstable electoral institutions. Take, for example, the case of Armenia where 4 parliamentary elections have taken place since 1995. In each of these four elections different rules to distribute and allocate seats have been followed. For instance, in 1995 there were 150 single-member districts, in 1999 that number decreased to 75, a further decreased to 56 seats happened in 2003 and, finally, in 2007 the number of single-member districts were 41 (Ruiz-Rufino 2008). Cases like Armenia posit an unresolved question: Why do some electoral systems change often? Is it because such reforms are not effective?

By effective, I refer to the capacity of an electoral system to alter or shape the existing party fragmentation. In particular, the fragmentation of the legislature. The literature has shown us that major electoral reforms - like adopting or not PR - were the consequence of strategic calculations of political actors. The literature and the cumulative knowledge on this topic begin to be vast (Rokkan 1970; Boix 1999; Cusack, Iversen, and Soskice 2007), hence, we are in a position to truly understand the logic behind electoral institutional changes. The bottom line assumption is that major changes in electoral systems occur to accommodate to either the arrival of new voters or to maximize political weight in a context of increasing competition. So, rules might be changed with the ultimate intention of altering the existing or potential party fragmentation.

In answering the question about why some countries repeatedly change their electoral systems one could argue that, maybe, the intended goal of the reform was not met. In fact, the literature has not focussed on how much electoral institutional change is needed to really see a significant change in the party fragmentation. This paper intends to shed some light on this issue. I will do that by first explaining what the literature means by electoral system change and how following those existing definitions one may get incomplete conclusions. For example, the literature declares two consecutive electoral systems different if some significant variations in key institutional components are observed. These include a pre-determined increase/decrease of the legislature, number of district, magnitude or a change of the electoral formula (Lijphart 1994); also two electoral systems are believed to be different when, given two consecutive elections, there has been a non-democratic period (Golder 2005). These approaches have been dominant but if one looks closer to these conditions, a door for ambiguity opens. The dominant paradigm on this issue does not provide with clear reasons to

believe why a variation of, say, 22% of the assembly size produces a new electoral system while a variation of 18% falls short.

I argue that to better understand the connection between electoral institutional change and differences in parliamentary fragmentation, one must look at different indicators. One is the predictor of seat winning parties announced by Taagepera (2007). This indicator combines two key institutional components of an electoral system - district magnitude and assembly size - to anticipate the potential number of seat winning parties. Electoral systems change can, then, be defined and quantified by looking at how much variation this indicator shows after two consecutive elections. This approach posits us in a better position to understand the effect of electoral system change since it allows us to calculate how much change would alter the preferences of the voters to the point that a new party equilibrium emerged (Duverger 1954).

After analyzing 483 parliamentary elections occurred in 71 countries between 1945-2000, I show that in order to see a significant change in the variations of parliamentary party fragmentation in two consecutive elections, a considerable institutional change should be observed. This could explain why some countries change so often their electoral system.

The rest of the article proceeds as follows. First, I review the procedures to distinguish two electoral systems commonly accepted by the literature. Second, I offer an alternative way to account for changes of electoral institutions. Thirdly, I develop an empirical model that seeks to isolate the effect of electoral rules on party system. In so doing, I deal with an inherent endogeneity problem. Finally, I summarize the main results.

Traditional changes in Electoral Systems

According to Lijphart two different electoral systems differ when a significant variation in any of the institutional components is observed (Lijphart 1994). This variation is arbitrarily set up at 20%. So, if an electoral system in election t-1 has an assembly of 100 seats and a new assembly of 120 is elected in election t, then we should consider these two electoral systems as different given the variation of 20% of assembly size that can be observed between the electoral systems used in periods $t-1$ and t. The same logic can be applied to district magnitudes or legal thresholds (Lijphart 1994:13).

Following this criterion, the electoral system used in the nine parliamentary

elections that took place in the Dominican Republic between 1966 and 1998 has been changed three times. In 1974, the assembly size varied from 74 to 91 seats (23% variation). Again, assembly size increased up to 120 members in 1982 (31,2% variation) and in 1998 the chamber also increased up to 150 members (25%).

As a corollary of the "20 percent criterion", a different electoral system is also observed when a different electoral formula is used in two consecutive elections. So, in 1947, the electoral system used in Brazil allocated all the parliamentary seats applying the Hare quota but in the next parliamentary elections (1950), the 304 seats of the Brazilian Parliament were allocated using the D'hondt method. To Lijphart, this shift in the use of electoral formulas was sufficient to qualify the two electoral systems as different. Similar electoral formula changes took place in Israel, Norway, Sweden,Bolivia among others between 1945-2000.

This traditional common wisdom can be challenged if one assumes that an electoral system is changed to alter an existing distribution of power (seats) among parties.

Challenging the electoral formula criterion

If an electoral reformer seeks to alter the existing party system by just changing the electoral formula, it is not clear that this change will produced the expected outcome. No one would doubt that changing the electoral formula is a truly formal change that should entitle the new electoral system to be considered different to its predecessor. However, if, one looks at the resulting party system, then, such a formal change is maybe just a cosmetic maneuver. Depending on what type of electoral formula the new system is adopting, one can expect a more or less change in the party system.

Table 1: Seat allocation using Hare, Droop and Sainte-Laguë

Party	Votes	Seats	Seats (%)
A	400	**10**	40
B	325	**8**	32
C	135	**3**	12
D	100	**3**	12
E	40	**1**	4
Total	1000	25	100
ENP	3.39		
ENPP	3.41		

To illustrate this idea, suppose a situation where 5 political parties compete in an electoral district with magnitude 25. This electoral district has 1000 voters who distributed their votes to these parties as table 1 shows. If we apply the most common quota-based electoral formulas – Hare and Droop – as well as the divisor-based Sainte-Laguë, we obtain the distribution of seats shown in the table.

As table 1 proves, an electoral system that uses these formulae indistinctly generate exactly the same distribution of seats given the above distribution of votes and given a relatively large district magnitude. Choosing between one of the most proportional electoral formulae, Hare, and a less proportional one, Sainte-Laguë, hardly generates any effect of the party system.

Now suppose again that a change of the electoral formula is likely to occur but the reformers debate about choosing either d'hondt or any of the three above mentioned electoral formulae. Table 2 shows how seats are distributed using D'hondt. Using D'hondt does make a difference in shaping the party system. As table 2 shows the two largest parties are honored one extra seat each and the two smallest parties loose likewise one seat each. The effective number of parliamentary parties (ENPP) is about 0.3 smaller when using D'hondt than when using any of the quota-based formulas or Sainte-Laguë. This result should not be surprising given that D'hondt is a rather majoritarian electoral formula while the other formulae under scrutiny do generate more proportional results (Gallagher 1992)

Table 2: Seat allocation using D'Hondt

Party	Votes	Seats	Seats (%)
A	400	**11**	44
B	325	**8**	36
C	135	**3**	12
D	100	**2**	8
E	30	**1**	4
Total	1000	25	100
ENP	3.39		
ENPP	3.14		

One could rightly argue that the effect of the electoral formula is bigger in smaller districts (Penades 2000). Table 3 shows how the ENPP varies when different district magnitudes are used. As one can see not much variation in the party system occurs when an electoral formula is changed no matter the size of

the district. If any, once again, only the use of D'hondt produces, in general, systematic changes in the party system compared to the rest of formula

Table 3: Variation of ENPP for different electoral formulae

M_d	Hare	Droop	S-L	D'hondt
5	2.77	2.77	2.77	2.77
7	3.26	3.26	3.26	2.57
10	3.57	2.94	2.94	2.94
13	3.59	2.96	3.59	2.96
15	3.35	3.35	3.35	2.84
20	3.5	3.5	3.5	3.17

These examples open up the possibility of questioning any change of electoral formula as synonymous of electoral system change. Given the effect on the party system, it would be more appropriate to identify a change in the electoral rules any time that we see a change from D'hondt to any other formula or vice versa.

This way of reasoning could be contested by those arguing that the reasoning is misleading because it is not taking into account the updating process that voters may do after observing a change of the electoral formula. I agree with the theoretical logic of this argument but the data shows something different. Between 1949 and 1999 the electoral system in Israel has changed twice. Members of the Knesset in 1951 were selected using the Hare quota instead of previously used D'hondt; in 1973, the abandoned Hare to re-adopt D'hondt once again. In Israel the members of the Knesset (120) are elected in a single district. This is important because the literature has shown that the district magnitude is an even more important variable to explain proportionality than the electoral formula (Rae 1967; Taagepera and Shugart 1989; Gallagher 1991). The political consequences of these electoral changes in Israel have been limited. The effect of changing the electoral formula has not helped in reducing the number of competitors or increasing the weight of the major political parties. The average effective number of parliamentary parties between 1951 and 1969, the period when the electoral system used the Hare quota, was about 5. Between 1973 and 1999, the D'hondt period, the ENPP was about 4.7. Therefore, changes of the electoral formula must be considered with some caution.

Challenging the institutional common wisdom

The "20 per cent criterion" established by Lijphart has been broadly used in the literature on electoral systems (Golder 2005). However, as Lijphart recognizes

"this criterion is necessarily arbitrary" (Lijphart 1994:13) implying that it is opened to be challenged. By using cut-off points one may ask why not a 25 or a 10 per cent criterion. In fact, this point is considered by Lijphart who argues that actually, any value between 10 and 25 percent could be used as cut-off point to differentiate two electoral systems.

Looking at a sample of countries applying both PR and Majority/Plurality electoral systems (or a combination of both methods) in the world between 1945-2000, we can find numerous cases of electoral system changes according to the above mentioned *lijphartian* criteria. Table 4 shows a sample of the changes observed in the countries analyzed. A total of 23 countries have experienced some substantial changes in their electoral system according to the *lijphartian* criteria. Normally, these changes involve a significant variation in any of the institutional components mentioned above. However, sometimes the changes involve a variation in more than one component. This is the case, for example, of Norway in 1953 when the move from D'hondt to modified Sainte-Laguë was accompanied by a substantial decrease in the number of districts (from 29 districts in 1949, Norway moved to 20 districts in 1953).

Against this (dominant) view, recent findings in the literature emphasize that electoral reforms are conducted to alter the current party system (Colomer 2005). If this is the case, we should observe significant variations in the party system when an electoral system is changed. This is quite true in most of the cases studied here but there exists some interesting cases that challenge the 20% criterion discussed here.

In 1991 the Portuguese parliament decreased its size by 8,2%. Between 1979 and 1987, 250 members where elected in the parliament; from 1991 on, the number of members of the parliament decreased to 230. According to Lijphart, this change does not qualify to be considered as a change in the electoral system; however if one looks at the consequences that such an institutional modification produced in the party system the conclusion might be different.

On average, the effective number of parties (ENPP) generated by the electoral system used in the first five democratic election was about 3.4 while the ENPP produced by the new electoral system after the 1991 election was about 3. That means that the distribution of electoral support among the major parties has changed significantly. In fact, between 1979 and 1987 the average parliamentary strength of the two most voted parties was 75%. Not only that, the structure of the party system changed substantially after the election in 1983 when the Social Democratic Party (PSD) and the Portuguese Socialists

Table 4: Changes of electoral systems according to Lijphart (1994)

Country	Year of Change	Type of change
Armenia	1995	23% increase assembly size
Benin	1995	31% increase assembly size
	1999	34% increase number of districts
Bolivia	1997	655% increase number of districts
Bulgaria	1991	40% decrease in assembly size
Cape Verde	1995	24% increase number of districts
Colombia	1991	50% decrease number of districts
Costa Rica	1962	26.7% increase assembly size
Dominican Republic	1974	23% increase assembly size
	1982	31% increase assembly size
	1998	25% increase assembly size
Ecuador	1998	76% increase assembly size
France	1958	359% increase number of districts
	1986	79% decrease number of districts
	1988	478% increase number of districts
Guatemala	1994	31% decrease assembly size
	1999	41% increase assembly size
Japan	1996	132% decrease number of districts
South Korea	1996	25% increase upper tier
Mongolia	1996	192% increase number of districts
Mali	1997	26% increase assembly size
Netherlands	1956	50% increase assembly size
New Zealand	1996	34% decrease number of districts
Norway	1953	31% decrease number of districts
Poland	1993	40% increase number of districts
Sweden	1970	50% increase assembly size
Sri Lanka	1960	63% increase assembly size
Turkey	1995	22.3% increase assembly size
Ukraine	1998	50% decrease number of districts

Party (PSP) co-opted minor political forces that had been participating with them in previous electoral coalitions. After the election in 1991 and once the assembly size had been decreased, the party system in Portugal was structured around two major parties (PSP and PSD) that together concentrated over 87% of the seats in parliament. Two major consequences could be observed after the reduction of the assembly size. The first one is that the average duration of political term was 4 years between 1991 and 1999 and 1,3 years between 1979 and 1987. The second consequence is the capacity of the electoral system to facilitate overwhelming majorities for the most voted party. In 1991, the PSD won over 50% of the seats in parliament and in 1999, the PSP also obtained an overwhelming majority. During the 1979-1987 period overwhelming majorities were also produced but beneficiaries were electoral coalitions rather than single political parties.

The situation observed in Portugal may be anecdotal and not representative but it may also be seen as an invitation to explore alternative explanations to distinguish between two consecutive electoral systems.

Why are two consecutive electoral systems different?

In empirical research, the operationalization of variables of interest is important in order to capture the variation one is interested in. In the case of measuring electoral system change, maybe the existing approaches are insufficient. As discussed above, if one is interested in understanding the effect of electoral institutional change in explaining variations in parliamentary fragmentation, then better definitions and operationalizations are needed. A possible way to do that is by calculating the expected number of seat-winning parties once a change, no matter its size, is observed.

Measuring expectations: the expected number of seat-winning parties

Recent studies have theoretically developed how the approximate number of seat-winning parties (SWP) can be anticipated by just looking at institutional components of an electoral system. As suggested by Taagepera (2007) given an assembly size, S, and a district magnitude, M_d, the best guess to find out

the number of parties that could win at least one seat is obtained using the following expression,

$$SWP = (S * M_d)^{1/4}$$

If district magnitude, M_d, is substituted by the average district magnitude[1], $\widehat{M}$, then the number of seat-winning parties that can win at least one seat nationwide[2] is[3]

$$SWP = \left(\frac{S^2}{E}\right)^{1/4} \tag{1}$$

How well does this theoretical predictor actually anticipate the number of parties that actually win a seat after an election? To test the capacity of prediction of Taagepera's SWP indicator, I have collected electoral data for 164 parliamentary elections that took place in 27 countries across the world since 1970. The sample is not exhaustive but it includes practically all electoral system designs that exist in the world. The data refer to the usual institutional data regarding electoral system -district magnitude, number of districts and assembly size- as well as the number of the parties that won at least one seat in the parliamentary election. To see the capacity of prediction of SWP over the actual number of seat-winning parties, I have run an OLS regression through the origin on SWP over the actual number of parties that won at least one seat. As picture 1 shows, the coefficient of SWP is significant at 99.9% and it slightly over-predicts the number of actual seat-winning parties by 10%. It is

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[1] The average district magnitude is calculated as follows

$$\widehat{M} = \left(\frac{S}{E}\right)$$

where E stands for the number of districts in which the territory is divided.

[2] As Taagepera explains, this predictor is based on the geometric mean between two average values: the geometric mean of the seat-winning number of parties at district level, $M_d^{1/2}$, and the geometric mean of the seat-winning number of parties if the whole country was a single district, $S_d^{1/2}$.

Balancing these two values, we obtain the seat product shown above. This function predicts approximately 12 seat-winning parties in The Netherlands (150 seats elected in single district) or about 5 seat-winning parties in the House of Commons which are approximately true.

All details of the seat product are fully explained in Taagepera (2007:133-4).

[3] N.B. When an electoral system has two tiers of seat allocation, the number of seat-winning parties is calculated according to the following formula:

$$SWP = \left(\frac{S^2}{S_u}\right)^{1/4}$$

where S_u is the number of seats at the upper level of seat allocation. This function follows the same logic as expression 1 above.

Figure 1: Relation between Taagepera's SWP and the actual number of parties winning, at least, one parliamentary seat.

R-squared = 0.85
ß = 1.10
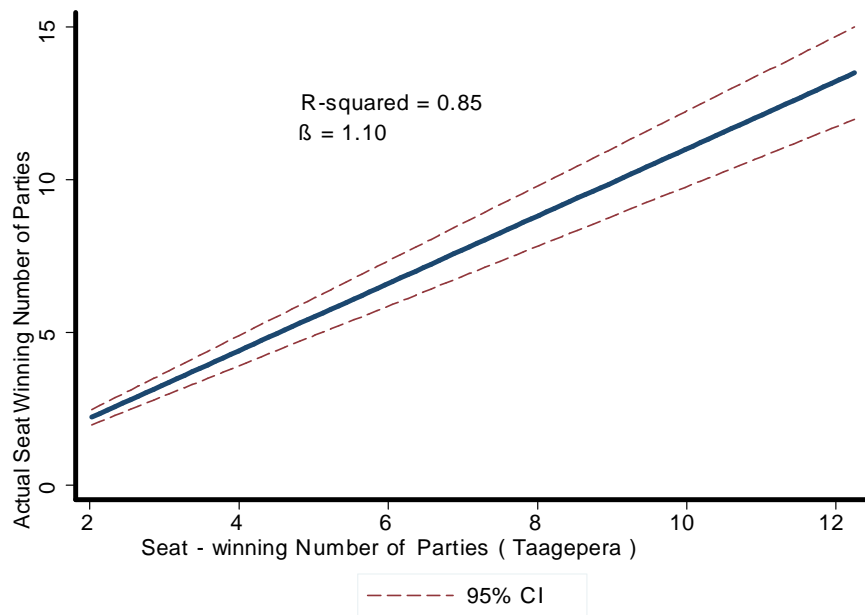
also worth pointing out, that by just using Taagepera's predictor about 85% of the variation within the number of seat-winning parties is explained. So, it seems that Rein Taagepera's approach generates a solid and robust predictor of the number of seat-winning parties.

As it stands, Taagepera's SWP can be used to compare the institutional variation of two consecutive electoral systems. Furthermore, given that SWP is a function of key components of electoral systems like assembly size and number of districts, this predictor can be used to explore the relationship between electoral institutional change and variations in parliamentary fragmentation.

Electoral institutional change and variations in parliamentary fragmentation.

In the rest of the article, I will explore how effective electoral institutional changes are with regard to altering an existing parliamentary fragmentation. If, as the literature has solidly shown, electoral systems change are strategic decisions conducted by political actors adjusting to new scenarios (Rokkan 1970), then it is worth exploring to which extent these changes are really effective. Following the implicit logic described in the literature, an effective electoral system change should be observed when a new distribution of power among the sea-winning parties is observed. The logic of this reasoning goes as follows: suppose that an electoral reformer seeks to bonus some large parties against some minor parties in order to reduce the partisan fragmentation of the parliament. Depending on the capacity to change the existing electoral system, the reformer conducts some changes in institutional components that may alter the number of seat-winning parties. Did these changes really generate the desired effect? In order to be successful, the electoral reformer depends on the voters's and party elite's behavior. If the voters and parties perceive those changes as sufficiently important they may update their political preferences and adjust them to the new institutional setting as anticipated by Duverger (1954) and later developed by Cox (1997): the mechanical effect of the electoral system may condition the way in which voters and parties behave. If this situation occurs, then a different parliamentary fragmentation may appear.

So, the relevant question is how much an electoral system must change to have the capacity to alter the existing party distribution in the parliament. From the discussion of the relevant literature above two different hypotheses can be announced.

Hypothesis 1 *Given two consecutive parliamentary elections, when the electoral formula is the only different component in the electoral system, then no significant differences in parliamentary fragmentation should be observed.*

Hypothesis 2 *Given two consecutive parliamentary elections, significant variations in party fragmentation should be observed when changes in the electoral system are notorious. By notorious, I mean relatively big changes in the number of districts, assembly size and change of electoral formula.*

Data and methodology

To test the different hypotheses, I have created a dataset covering 483 parliamentary elections occurred in 71 countries between 1945 and 2000. Since, I am interested in seeing the relationship between the change in the party structure once an institutional change in the electoral system is observed, each country has at least two observations.

The dependent variable refers to how much change in parliamentary fragmentation is observed given two consecutive elections. To calculate this value, I used the absolute difference in the effective number of parliamentary parties. More concretely, this variable is defined as

$$PARTY\_CHANGE = abs(ENPP_{t-1} - ENPP_t)$$

where ENPP refers to the effective number of parliamentary parties as defined by Laakso and Taagepera (1979) and t refers to the election year in which the electoral system changed. Figure 2 plots the dispersion of this variable and shows considerable variation: only in 2% of the sample the value of this variable is 0 and in 53% of the cases the variation is equal or smaller to 0.3. In other words, almost 50% of the sample generated variations in the level of parliamentary fragmentation higher than 0.3.

By a change in the electoral system, I mean a) a situation in which two different electoral formulae are used in two consecutive elections and b) a perceptible change in district magnitude, number of districts or assembly size in two consecutive elections. For example, in Spain the main independent variable is 0 because there has not been any electoral change since the first democratic elections in 1977. An electoral system happened, however, in France because it changed the electoral formula several times since 1945 - in particular in 1951,

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Figure 2: Distribution of differences in parliamentary fragmentation
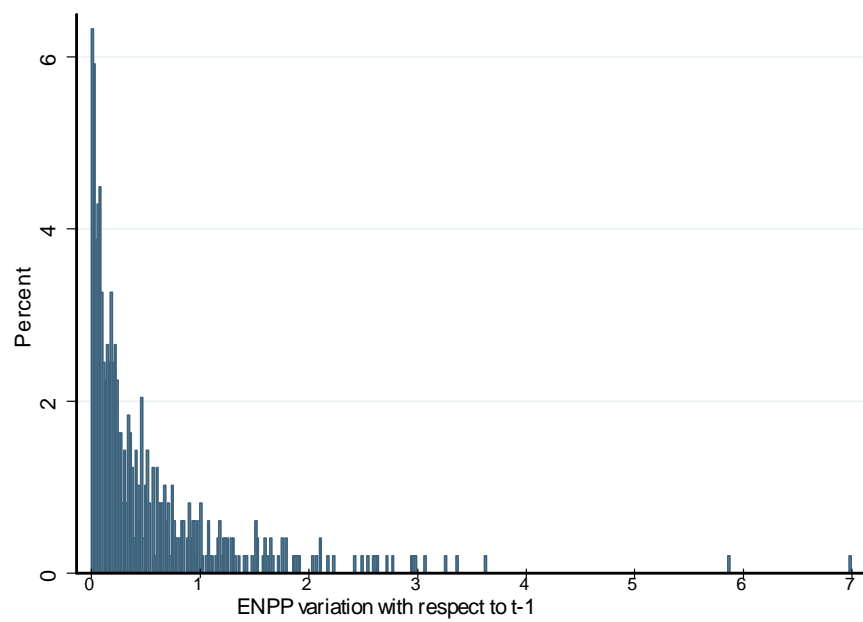
1973, 1986 and 1988. A third example is Ireland where the number of districts increased from 38 to 42 for the 1969 elections .

To capture these variations, I use two different variables. First, SWP_CHANGE shows the variation in the number of seat-winning parties using the predictor calculated by Taagepera (2007) as discussed previously. Formally, SWP_CHANGE is defined as

$$SWP\_CHANGE = abs(SWP_{t-1} - SWP_t)$$

SWP_CHANGE ranges from 0, Spain since 1977 as already mentioned, to 5.17 in Italy in 1994 where the country moved from an electoral system using 32 multi-member districts to another one electing 475 seats in single-member districts in a two-tier electoral system.

The second independent variable of interest refers to the electoral formula used to convert votes into seats. FORMULA_CHANGE is defined as

$$FORMULA\_CHANGE = abs(FORMULA_{t-1} - FORMULA_t)$$

where FORMULA refers to the formula used in the lower tier of seat allocations. This value has a value of 0 if the formula remained the same compared with the previous election - Spain - and 1, otherwise - France 1986. PARTY_CHANGE, SWP_CHANGE and FORMULA_CHANGE are calculated using the data on electoral systems collected by Golder (2005).

During the empirical analysis I use several control variables. THRESHOLD_CHANGE refers to how much legal threshold change from one election to another. To control for past electoral dynamics and type of government, I include two variables. First, ENP (lag) refers to the effective number of electoral parties that competed in t-1 election. Second, DIVIDED_GOV, refers to the number of parties that participated in government in the t-1 period (Carey and Hix 2011). Finally, I also control for other variables that may be related to explain variations in party fragmentation. AGE refers to age of democracy (Cheibub, Gandhi, and Vreeland 2010). ETHNICITY refers to level of ethnic heterogeneity as measured by (Alesina, Devlesschauwer, Easterly, Kurlat, and Wacziarg 2003). POPULATION and GROWTH are indicators from the World Bank referring to population and economic growth respectively.

The empirical form of the full model has the following form:

$$PARTY\_CHANGE \quad = \quad F(Constant, SWP\_CHANGE,$$
$$FORMULA\_CHANGE, CONTROLS) + \epsilon$$

To explore the relationship between differences in parliamentary fragmentation and changes in electoral systems I have first run two OLS models. A full account of those results are offered in Table 5 in Appendix A. Graph 3 shows the size, direction and significance of the main independent variables in the two models that I have estimated. The first model, baseline, only consider the effect of the two main independent variables. The coefficients show that changes in institutional components such as number of districts or assembly size do explain variations in the fragmentation of the parliament across elections. The baseline model also shows that changing the electoral formula is irrelevant. The strength of SWP_CHANGE is confirmed in the full model once the rest of the control variables are considered. In both models the size, direction and significance is similar. The larger the change in the number of districts or assembly size, the larger the expected fragmentation in the parliament once the new rules are implemented.

Table 5 in Appendix A also shows other interesting results. As one would expect, party fragmentation is also well explained by the previous degree of party competition, the number of actors involved in the executive and ethnic homogeneity. Higher levels of electoral competition among parties in the previous election explain high differences in the parliamentary fragmentation in the current election. Ethnic cleavages are also relevant and holding everything else constant, the more ethnically heterogenous the country the higher the difference in parliamentary fragmentation. Finally, the number of parties which have a voice in the executive has a small and negative effect, i.e., more parties in government reduce the expected parliamentary fragmentation.

Accounting for endogeneity

The coefficients displayed in graph 3 may be biased. Suppose that there is an observable variable that could simultaneously affect the difference in party fragmentation and the levels of institutional change. In that case, the reason why we observe high levels of party fragmentation might not be due to institutional change but to something else. One possible variable could be, for example,

Figure 3: OLS results
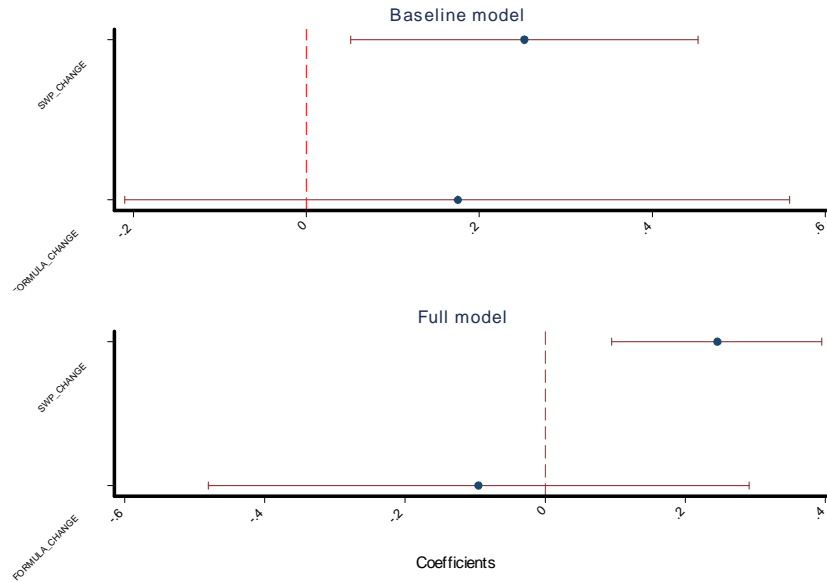
the number of parties in the executive. The higher the number of parties, the harder the possibility to change the *statu-quo* (Tsebelis 1995). A second variable is the level of previous electoral competition. The higher the number of parties competing to win a seat in say, electoral systems showing little proportionality, the higher the probability they would push towards a more proportional set of electoral rules (Colomer 2005). Graph 4 finds confirmation to support the association between these variables and the probability of observing changes in the electoral system. In both graphs, the vertical axis shows the proportion of changes in the electoral system for each number (rounded) of parties competing in a election and for each party with a voice in the executive.

The trend shown in graph 4 suggest that the coefficients of the models shown in Table 5 could be biased due to a selection problem. Furthermore, it is sensible to think that apart from observable factors there are also other non-observable factors which may be simultaneously affecting both the dependent and independent variables. To account for this problem, I will use a two-step Heckman model (Heckman 1979). In this sense, I first run a probit model to calculate the probability that an election with different rules would be observed as un-

Figure 4: ES changes, party competition and fractionalization of the executive
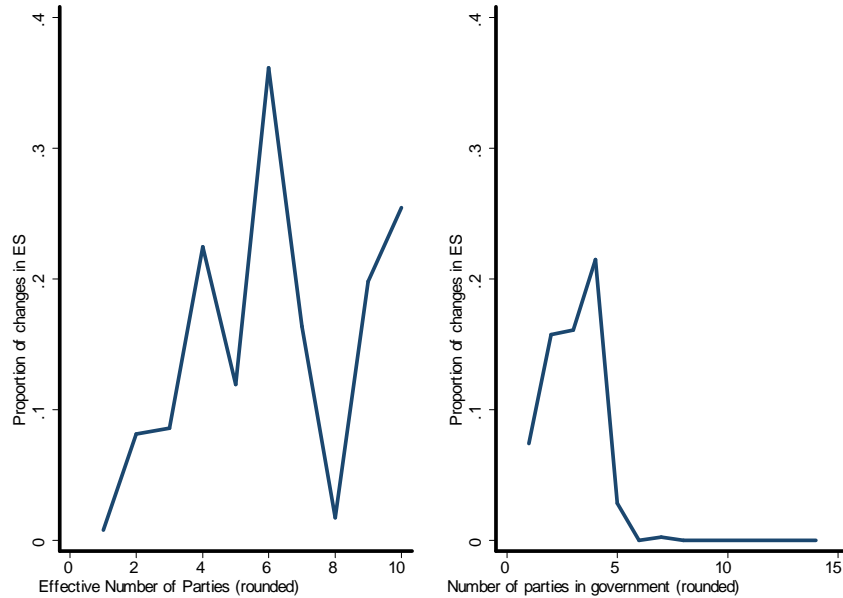
changed. This probability is the inverse Mill's ratio (imr) and I will use it as an instrument to correct the potential bias.

The second step involves running OLS regressions for the sample of cases where no institutional changed was observed and the sample of cases where any type of change was observed - i.e. either the electoral formula was changed or there was a change in the number of districts or assembly size. In both samples the models include the variable imr. By including this new variable, the new OLS coefficients should be corrected and we should be able to make better inferences about what explains variations in parliamentary fragmentation.

Graph 5 shows the coefficients of the probit model I have used to estimate the selection equation. Using those coefficients shown in table 6, I can calculate for each observation the probability that an election where change of electoral rules occurred were remained stable. The graph also shows some patterns to understand why electoral system changes are observed. Electoral systems are more likely to change if the country is highly populated. In populated areas, political actors may have incentives to try different electoral institutional designs to explore which one accommodates better to the idiosyncrasy of the country.

A second reading of graph 5 has to do with the role parties play in changing the electoral system. Previous political competition at the electoral arena does not explain why an electoral system change. However, the (lagged) number of political actors in the executive is a key important variable to understand institutional change. This finding goes in line with the veto-player theory : the larger the number of parties in the government, the harder it is to change the existing *statu-quo* (Tsebelis 1995). Graph 5 also shows factors that do not explain electoral system change: ethnicity is not significant and the age of the political regimes does not explain either variations of the dependent variable.

As already explained, the probit model plotted in graph 5 can be used to calculate the inverse Mill's ratio. This ratio can be used as an instrument to identify the effect of institutional change on the difference of parliamentary fragmentation. Table 7 shows the new OLS models once imr is incorporated. The first model accounts for those observations were elections used the same electoral rules between t-1 and t. In this model, the key explanatory variable is the past electoral competition among parties. The direction of the causality is the same as the one displayed in the full model.

For the purpose of this article, though, one must look at the second model of table 7. The coefficients shown here corresponds to those observations where an electoral system was observed between t and t-1. The imr variable is significant indicating that the previous models of table 5 were biased. This bias explain several interesting findings. First, the effect of how divided the government was in the past election is the most important component to understand differences in the parliamentary fragmentation. Second, the level of partisan electoral competition is also relevant to understand this issue. Finally, and more relevant, the electoral institutional change also explain variations in the effective number of parliamentary parties between t-1 and t.

To capture the effect of changing the electoral rules more neatly, I have included an interaction term in this model. The idea of this interaction is to test whether changes involving the use of different electoral formula and variations in the number of districts or assembly size produce a higher effect on the dependent variable than changes involving only changes in districts and assembly size. To ease the interpretation of this interaction, graph 6 plots both scenarios along with their 95% confidence intervals.

The slope of the curve when a simultaneous change of districts, seats and formula take place is 0.28 while the slope of the curve in case there is no change of electoral formula is 0.20. The effect is not only bigger when the full change is

Figure 5: Determinants of electoral system change
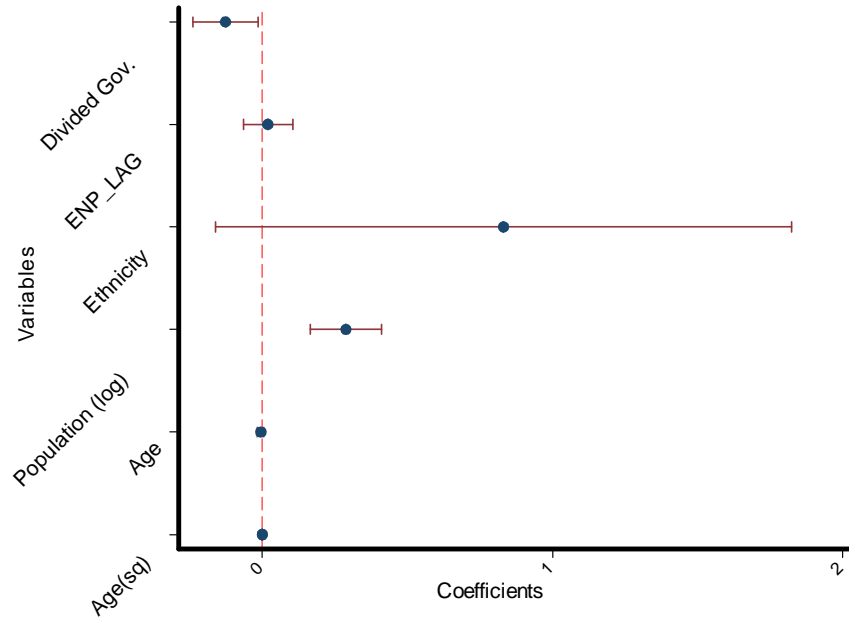
in place but also statistically significant. As the graph to the right shows, the slope of the curve when there is a change but the same formula is used is not different from 0 using the 95% confidence interval. In the case of a full change, the slope is significant but only within a threshold of SWP_CHANGE. More concretely, when SWP_CHANGE is greater than 0.47 and smaller than 2.86 and given a change of electoral formula, then it can be said that the effect of parliamentary fragmentation is explained by the change of the electoral system.

The size of these institutional changes are considerable. For example, a variation of 0.47 in the SWP_CHANGE variable is found in Denmark in 1953. In the elections occurred in September of that year a new electoral system was used. The assembly increase from 149 to 173 seats (16% variation) and modified Sainte-Laguë was used instead of D´hondt. So, as expected only big institutional changes produce significant changes in the composition of parliament.

So far, the analysis is focused on what happens in the election right after a reform is observed. Using Duverger's terminology, the models above account for the mechanical effect of the new electoral rules. Duverger, however, also identified a psychological effect (Duverger 1954). Using that logic, voters and

Figure 6: Institutional electoral system changes and parliamentary fragmentation
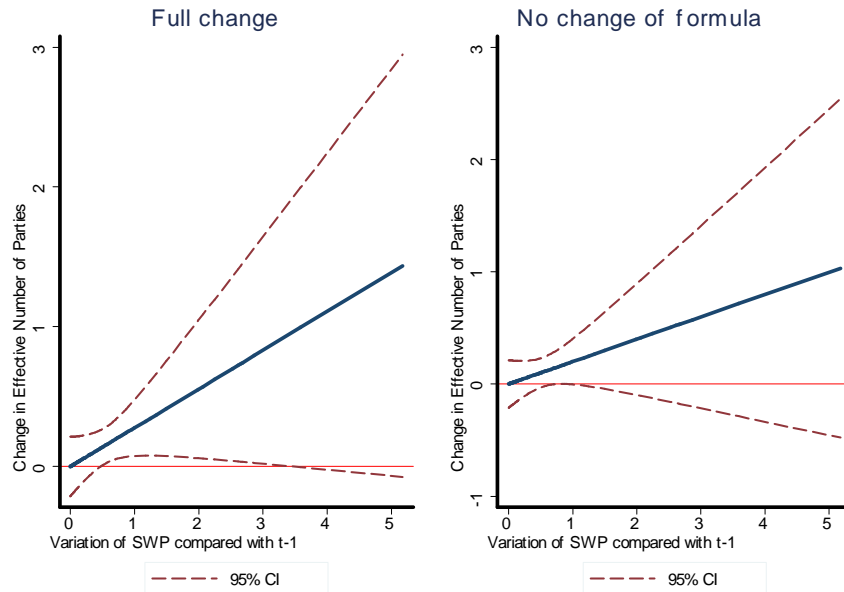
party elites would need some time to learn about the political consequences of electoral systems and use that new knowledge to update their strategies accordingly. If this psychological effect does, in fact, take place, then, one should also observe some significant variation in the level of parliamentary fragmentation in, say, the second election after changing the electoral rules.

Model 3 in table 7 shows the coefficients for a regression where this scenario is considered. In this model, the main independent variables - SWP_CHANGE and FORMULA_CHANGE - take the value of the last electoral reform. The dependent variable, however, measures the absolute parliamentary difference between the election before the change of rules took place and the resulting parliamentary fragmentation two elections after the rules changed. More formally

$$PARTY\_CHANGE = abs(ENPP_{t-1} - ENPP_{t+1})$$

Thus, the model only considers those observations where no other electoral changes were observed since the last one. For example, in 1968 the members of

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the Danish parliament were elected in 23 districts but in 1971 the number of constituencies decreased to 17 districts. Model 3 in table 7 includes the Danish elections in 1973 since the rules used there were the same than the ones used in 1971. On the other hand, the model does not include any observation from Benin since the electoral rules changed for every election that occurred between 1991 and 1999. The model accounts for 76 observations in 33 countries.

The regression coefficients show that the effect of changing the electoral rules no longer explains differences in parliamentary fragmentation. Only the electoral competition observed in the previous election has an significant effect on the dependent variable. This finding could suggest that voters and parties assimilate the effect of electoral reforms when they happen and not in the near future. In other words, that voters and parties do not need to learn the mechanical effect of the new electoral rules by looking at previous elections. This idea is consistent with the overall argument of this article, namely, that only major electoral reforms generate significant variations in parliamentary fragmentation because both voters and parties are permeable to the dynamics of the new electoral system right from its instauration.

Conclusions

In 1970, Stein Rokkan inaugurated a research line focused on why proportional representation was adopted at the turn of the twentieth century (Rokkan 1970). In the following decades, Rokkan's societal approach was enriched by political economy approaches (Rogowski 1987), by a refinement of the causal mechanisms (Boix 1999; Cusack, Iversen, and Soskice 2007), or by extending the geographical and temporal span to newer democracies (Jones-Loung 2000). Today, the debate is not over (Calvo 2009) but the emergence of a considerable number of new democracies since 1974 has recently shifted the emphasis of this debate. Without dismissing the importance of the question initiated by Rokkan, today there is a stronger emphasis in understanding why electoral systems change rather than knowing the origins of proportional representation (Benoit and Schiemann 2001; Benoit and Hayden 2004; Colomer 2005; Katz 2005; Benoit 2007)

Some of the new democracies have been characterized by producing rather unstable electoral institutions. At least, two questions emerge from observing this institutional dynamics. First, we could ask why these changes take place and some interesting answers have already been offered for the case of Latin

America (Remmer 2008). A second question, which has been the subject of this article, is how effective electoral system changes are. By asking this question, I am testing the capacity of the new rules to alter an existing parliamentary fragmentation, the underlying assumption used by scholars to explain why electoral system change.

In this article, I argue that the effectivity of electoral system in altering the number of parliamentary partay demands a large amount of change. In particular, one should expect significant changes in the effective number of parliamentary parties only when large changes in the number of districts or assembly size are produced and when those changes are simultaneous with a change of electoral formula. Only then, one should expect important variations in the fragmentation of the party. The logic behind this empirical finding is that the mechanical behavior of an electoral system once a change has taken place may not be perceived by voters and party elites as very different from the previous. Only when those changes are big, one could expect an inmediate triggering effect on voters and party strategies. Furthermore, the models used here suggest that the duvergerian psychological effect does not apply. Electoral reforms observed in period t do not explain parliamentary differences between t-1 and t+1.

The approach developed here leaves some room for improvement, though. Here, I have just focused on two institutional components that may alter the party system, namely assembly size and district magnitude. As pointed out by Rae (1967) or Lijphart (1994), ballots can also have an effect on party systems. I leave this door open for future research.

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1 Appendix A

Table 5: OLS regressions

VARIABLES	(1) ENPP_CHANGE	(2) ENPP_CHANGE
SWP_CHANGE	0.252**	0.246***
	(0.101)	(0.0750)
FORMULA_CHANGE	0.174	-0.0949
	(0.193)	(0.193)
THRESHOLD_CHANGE		20.06
		(18.26)
ENEP (lag)		0.178***
		(0.0345)
DIVIDED_GOV		-0.0513**
		(0.0255)
ETHNICITY		0.531***
		(0.163)
AGE		-0.00359*
		(0.00209)
AGE (sq.)		4.00e-06
		(1.07e-05)
POPULATION (log)		0.0310
		(0.0196)
GROWTH (lag)		-0.000764
		(0.00892)
Constant	0.483***	-0.199
	(0.0560)	(0.144)
Observations	483	451
R-squared	0.040	0.332

Standard errors clustered by countries in parentheses

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

Table 6: Probit regression

EQUATION	VARIABLES	(1) PROBIT
ANY_CHANGE	DIVIDED_GOV	-0.127**
		(0.0574)
	ENEP (lag)	0.0197
		(0.0442)
	ef	0.831
		(0.507)
	POPULATION (log)	0.288***
		(0.0629)
	AGE	-0.00547
		(0.00633)
	AGE (sq.)	2.25e-05
		(3.79e-05)
	GROWTH (lag)	-0.00475
		(0.0154)
	Constant	-0.995***
		(0.315)
	Observations	454

Standard errors clustered by countries in parentheses

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

Table 7: OLS corrected regressions

VARIABLES	(1) No change	(2) Change	(3) Change (t+1)
SWP_CHANGE		0.199*	0.128
		(0.108)	(0.205)
FORMULA_CHANGE		-0.0888	0.274
		(0.238)	(0.224)
Interaction		0.0785	-0.504
		(0.165)	(0.309)
THRESHOLD_CHANGE	63.86	19.47	
	(52.39)	(16.21)	
ENEP (lag)	0.147***	0.248***	0.361*
	(0.0500)	(0.0803)	(0.185)
DIVIDED_GOV	-0.0405	-0.260**	-0.115
	(0.217)	(0.107)	(0.581)
ETHNICITY	0.599	1.502*	0.818
	(1.446)	(0.835)	(3.987)
AGE	-0.00459	-0.0104	-0.0164
	(0.00777)	(0.00689)	(0.0231)
AGE (sq.)	1.08e-05	3.24e-05	6.98e-05
	(2.65e-05)	(2.83e-05)	(8.29e-05)
POPULATION (log)	0.0173	0.439*	0.473
	(0.488)	(0.228)	(1.322)
GROWTH (lag)	-0.00453	0.000937	-0.0228
	(0.0111)	(0.0150)	(0.0355)
imr	0.164	2.036*	1.922
	(2.411)	(1.172)	(6.479)
Constant	-0.248	-3.390**	-3.478
	(3.696)	(1.629)	(9.727)
Observations	284	167	76
R-squared	0.251	0.417	0.424

Standard errors clustered by countries in parentheses

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