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Research Note

Party Politics

Assessing electoral coordination: A quasi-experimental design of changes in district magnitude over time

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Ignacio Lago
Universitat Pompeu Fabra, Spain

Ferran Martínez i Coma
Griffith University, Australia

Abstract

This paper examines the impact of district magnitude, defined as the number of representatives elected per district, on the number of political parties. Conventional wisdom, supported by cross-national and within-country studies, indicates a positive and curvilinear relationship between district magnitude and the number of parties, with diminishing returns in larger-magnitude districts. However, this relationship is complicated by the increasing regionalization of party systems and the distinct socio-economic compositions of districts correlated with district magnitude. To address these limitations and obtain an appropriate counterfactual, we employ a quasi-experimental design using data from Spain, where district magnitude changes by only one seat in some districts and elections. Our findings align with previous research, confirming that the number of electoral parties increases with district magnitude, particularly in low-magnitude districts.

Keywords

district magnitude, electoral system, number of parties, quasi-experiment

Introduction

Understanding what influences the number of political parties is fundamental to the research agenda in Political Science. District magnitude, the number of representatives elected per district, is the 'decisive factor' in shaping party systems (Taagepera and Shugart 1989: 112). Larger district magnitudes lead to an increase in the number of parties because smaller parties have a better chance of winning seats and both voters and elites have weaker incentives to engage in district-level coordination. In Proportional Representation (PR) systems, the relationship between district magnitude and the number of parties is curvilinear and shows sharply diminishing returns to increases in large-magnitude districts. The conventional wisdom is embodied in the $M + 1$ rule, which states that the number of competitors entering a given race tends to be no more than M + 1 (where M is district magnitude) (Cox, 1997).

The empirical evidence supporting the positive and curvilinear relationship between district magnitude and the number of parties mainly comes from both cross-national (e.g., Carey and Hix, 2011; Neto and Cox, 1997; Lublin, 2017) and within-country (e.g., Benoit, 2001; Kedar et al., 2021; Lago and Martínez i Coma, 2024) observational data analyses. We argue that observational studies are not entirely compelling when attempting to establish an appropriate counterfactual to estimate the effect of district magnitude on the number of parties. This is due to the varied social composition of districts and the increasing regionalization of party systems in recent decades. As a result, confounders are not perfectly controlled when comparing the number of parties across districts within countries or across different electoral systems.

In this paper, we employ a quasi-experimental design to investigate the conventional wisdom regarding the relationship between district magnitude and the number of parties. Using longitudinal data from Spain, we establish an

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Corresponding author:
Ferran Martínez i Coma, School of Government and International Relations, Griffith University, 170 Kessels Road, Nathan, QLD 4111, Australia.
Email: f.martinezicoma@griffith.edu.au

appropriate counterfactual by comparing the same districts across elections with marginal differences in district magnitude, while maintaining consistent social composition and general demand for parties. Specifically, we estimate the effect of district magnitude by comparing changes in the number of parties over time between districts where seats are added or subtracted (the treatment group) and districts where seat allocation remains unchanged (the control groups). Our results align with previous research findings, further confirming the positive and curvilinear effect of district magnitude on the fragmentation of party systems.

District magnitude and the number of parties

Both within-country and cross-national analyses of party system fragmentation hinge on the correlation between district magnitude or national averages and the number of local or national parties. The underlying methodological assumption is that the demand for parties is uniform across districts within countries. Given that the demand for parties is nationalized, measures of national diversity such as ethnolinguistic fragmentation suffice in cross-national studies. Comparing districts that allocate different numbers of seats or countries with varying average district magnitudes offers an appropriate counterfactual to estimate the effect of district magnitude on the number of parties.

This approach faces two main challenges. First, the worldwide trend towards the decentralization of governance (Lago, 2021) encourages the growth of regional parties in national elections (Brancati, 2008; Lublin, 2024). If regionalization is significant, the effect of district magnitude on the number of parties is expected to be undermined. Since there is no reason to expect any positive correlation between district magnitude and the strength of regional parties, the correlation between district magnitude and the number of parties will be weaker when some parties only enter the race in specific districts within the country.

Second, as Monroe and Rose (2002: 68) argue, in PR systems, seats are typically awarded in geographically defined districts using existing administrative divisions. Seats are allocated across districts mainly (if there is some malapportionment) or exclusively depending on population. To the extent that some aspects of mass political opinion correlated with partisan political sentiment—such as urbanization or demographics like employment or elderly population— are also correlated with district magnitude, it is unclear whether the greater fragmentation in high-magnitude districts is explained by district magnitude or the different composition of electorates. Clearly, this is not an issue in countries relying on first-past-the-post in single-member districts.

Consequently, the current situation, in which neither observational cross-national studies nor within-country studies can isolate the effect of districts from other correlated variables, raises the question of whether conventional wisdom holds in a more controlled setting. If the results obtained in a quasi-experimental design are similar to those seen with observational data, we can be definitively convinced of our understanding. However, if the results differ, new theoretical developments and empirical advancements will be necessary.

Hence, in this paper, we propose an alternative approach to examine the effect of district magnitude on the number of parties, specifically using a quasi-experimental design. Our approach relies on longitudinal data from a single country, where district magnitude changes by only one seat in some districts and elections, allowing us to obtain an appropriate counterfactual. Simultaneously, there are significant differences in the number of seats to be allocated across districts. We compare the same districts across elections with a marginal difference in district magnitude while keeping constant the social composition of the districts and the general district-level demand for parties. Specifically, we estimate the effect of district magnitude by comparing the changes in the number of parties over time between districts where a seat is added or subtracted (the treatment group) and districts where the number of seats to be allocated remains unchanged (the control group). We test two hypotheses capturing the positive and curvilinear effect of district magnitude on the number of parties. The former is tested with Hypothesis 1 and the latter with Hypothesis 2:

- *Hypothesis 1: The number of electoral parties increases with district magnitude in a curvilinear manner.*
- *Hypothesis 2: Due to diminishing returns in the number of parties as district magnitude increases, the addition or subtraction of individual seats affects the number of electoral parties only in low-magnitude districts.*

Data and methods

To achieve a quasi-experimental design when examining the impact of district magnitude on the number parties, five conditions must be met. Firstly, district magnitude should vary within countries or electoral systems in the lower tier. This precludes countries utilizing majoritarian, mixed-member, and PR systems with single-nation districts (e.g., Israel) or districts of uniform magnitude (e.g., Malta). By the 2010s, this condition excluded approximately 50% of legislative elections globally (Bormann and Golder, 2022: 4).

Secondly, the electoral system must remain unchanged, with no major or minor reforms (Katz, 2005), except for adjustments in the number of seats to be filled in districts due to apportionment. Electoral reforms are not exceptional. According to data compiled by Lago and Martínez i Coma

(2023), there were 43 major electoral reforms in lower-house elections across 22 countries from 1945 to 2020.

Thirdly, seats in PR systems should be allocated within districts that lack upper tiers or compensatory seats, as these factors reduce the influence of district magnitude on the number of local parties. This condition excludes countries like Denmark and Ecuador.

Fourthly, the number of districts should be sufficiently large to support statistical inference and allow significant changes in district magnitude. For instance, the 9 districts in the electoral system employed in Bolivia from 1979 to 1993 are not enough for causal inference. Similarly, between 1979 and 1987, five legislative elections were held in Portugal to elect 250 MPs in 20 districts. In 1980, there were no changes in district magnitude; in 1983, 1985, and 1987, only two districts in each election changed their district magnitude by one unit (one district increased and the other decreased). Thus, the analysis should rely on only 6 cases of changing district magnitude.

Finally, ideally, some districts should change by only one unit (increasing or decreasing) across elections, while others remain unchanged, in order to isolate the effect of district magnitude on the number of parties. This approach aligns with the definition of a regression coefficient in econometrics or a causal effect in social sciences (King et al., 1994: 81-82).

Spain's electoral system meets all these requirements and provides a unique opportunity to estimate the effect of district magnitude on the number of parties using quasi-experimental data. The electoral system remains unchanged in the 16 lower-house elections held since the founding election in 1977 until 2023. Lower house elections in Spain are held under a PR system with the D'Hondt formula and closed lists in the 52 districts. The number of MPs is 350. Two districts (Ceuta and Melilla, semi-enclaves in Morocco) are single-member while the remaining 50 districts are multimember using the existing administrative divisions established in 1833 and unchanged since then. Each multimember district receives two seats ($2 \times 50 = 100$) while the remaining 248 seats are apportioned according to population. More specifically, the apportionment takes place as follows: (i) an allotment quota is obtained by dividing the total population of Spain into 248; (ii) each district is allotted a number of seats in round figures by dividing its population by the quota; (iii) the remaining seats are allocated to the districts with the highest decimal fractions in their quotient. The district magnitude mode in every election is five seats. Interestingly, due to changes in apportionment, the number of seats increases or decreases from one election to the next only by one unit, never by two or more units. Finally, Spain is so regionalized and fractionalized that we can expect the effect of district magnitude on the number of parties to be undermined (Monroe and Rose, 2002). This is one of the conditions challenging the conventional wisdom based on observational data, which our quasi-experimental design controls for. The district structure in the 16 elections held during the period from 1977 to 2023 is displayed in Figure 1.

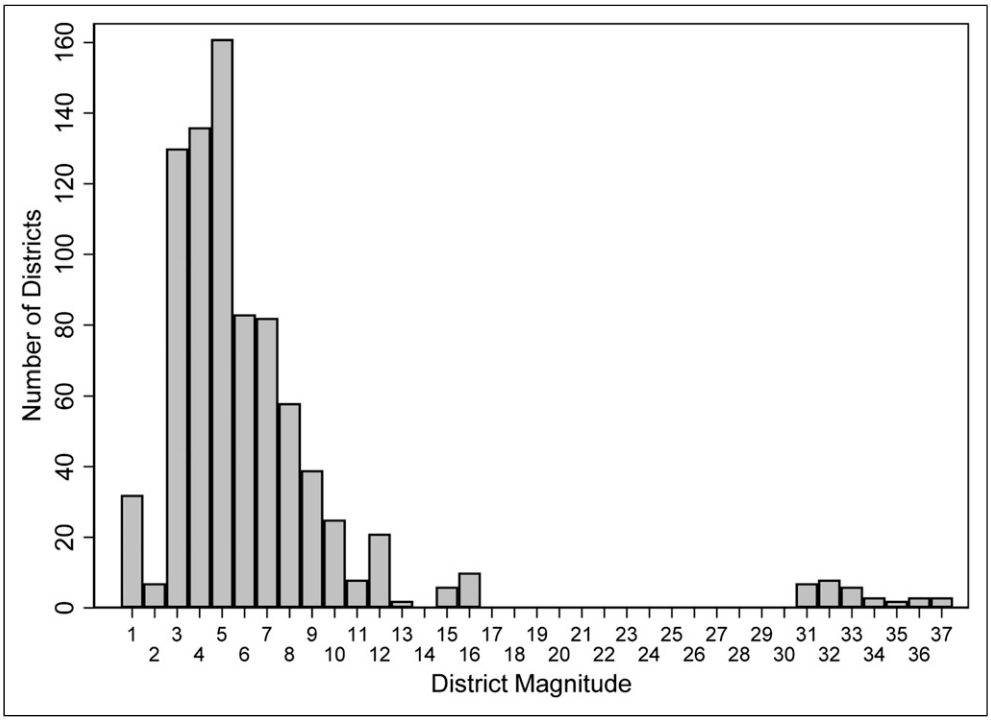

Figure 1. District structure in Spain, 1977-2023.

Table 1 illustrates the changes in district magnitude across the 52 districts in Spain's electoral system from 1977 to 2023. For each election, we indicate whether the number of seats to be filled in each district has increased by one unit, decreased by one unit, or remained unchanged. The total number of changes in district magnitude is 57: in 29 districts (3.49%), the magnitude has increased, while in 28 districts (3.37%), it has decreased. Thus, the most common scenario is no change in district magnitude (93.15%). The 29 districts where the magnitude has increased allocate more than five seats, whereas in 10 districts with five or fewer seats and in 18 districts with more than five seats, the magnitude has decreased. Notably, changes in district magnitude are cumulative, leading some districts to experience multiple changes in seat allocation. Madrid, the largest district, has undergone the most changes, with five increases.

To examine how district magnitude affects the number of parties, we built a dataset including all district election data for the 16 lower house elections held in the 1977-period 2023. The number of observations is 52 districts × 16 elections = 832 observations. The dependent variable is the effective number of electoral parties *(ENEP)*, following Laakso and Taagepera (1979), and is calculated as follows: for n parties receiving votes, $N = \frac{1}{\sum_{i=1}^{ni} p_i^2}$, where p is the proportion of votes obtained by party i in the election. We included all parties that received votes, without applying any threshold for inclusion in the measure. The data source is Spain's Ministry of the Interior (https://infoelectoral.interior.gob.es/en/elecciones-celebradas/resultados-electorales/).

We used two measures of district magnitude: the logarithm of the number of seats to be allocated in a given district in the previous election (*District Magnitude$_{e-1}$ (logged)*), and a dummy variable coded 1 if the number of seats to be allocated in a district in the previous election is five or fewer, and 0 otherwise (*Low-magnitude District $_{e-1}$*). We considered low-magnitude districts to be those with five or fewer seats. According to Carey and Hix (2011: 385), the strategic calculations of voters in low-magnitude multi-member districts should mirror those in single-member districts. Empirical evidence from Colombia, Japan, and Spain suggests that strategic voting has little impact on the number of parties in districts with a magnitude greater than five (Cox, 1997: Ch. 5; Cox and Shugart, 1996). Using observational data, Carey and Hix (2011) found that increasing district size from one to five seats raises the number of effective parties in parliament by about one, after which the relationship plateaus as district size surpasses five seats. Similarly, lab. experiments show that the relationship between the number of parties and district magnitude remains nearly flat once the district magnitude reaches five (St-Vincent et al., 2016). We rely on the previous election rather than the contemporaneous election because, in the latter, district magnitude would already be capturing the effect of the change in the number of seats to be filled.[1] District magnitude change is operationalized as the difference in the number of seats to be allocated in a district in comparison with the previous one. The three possible values are +1 (i.e., district magnitude increased by one seat). 0 (i.e. district magnitude remained unchanged), and −1 (i.e., district magnitude decreased by one seat. We label this variable *District Magnitude Change*. The descriptive statistics are displayed in Table 2. The dataset can be found at Harvard's Dataverse.

Table 1. Changes in district magnitude in Spain's electoral system, 1977-2023.

	Change in district magnitude			
Election	1 seat less	No change	1 seat more	Total districts
1977	0	52	0	52
1979	0	52	0	52
1982	0	52	0	52
1986	6	40	6	52
1989	3	46	3	52
1993	3	46	3	52
1996	2	48	2	52
2000	0	52	0	52
2004	4	44	4	52
2008	4	44	4	52
2011	1	50	1	52
2015	2	48	2	52
2016	1	50	1	52
2019 (Apr)	1	49	2	52
2019 (Nov)	0	52	0	52
2023	1	50	1	52

To investigate whether changes in district magnitude affect the number of parties, we regress *ENEP* at the district-election level on the logarithm of district magnitude in the previous election and the change in district magnitude. We use panel data and ordinary least squares (OLS) with cross-sectional data as estimator. The robust standard errors are clustered by district due to the dependency in the data structure. District fixed effects are excluded to avoid absorbing the effect of district magnitude. Similarly, the lagged number of parties was not included in the right side of the equation because it captures most of the effect of district magnitude. Given the significant changes in the number of parties over time, we add election fixed effects. Finally, an Augmented Dickey Fuller test of stationarity suggests that both series (nationalization and rural population) are stationary.[2]

In order to test our two hypotheses, we run two specifications. The additive specification (1) tests that district magnitude positively affects the number of parties, while the interactive specification (2) tests that changing district

magnitude by one unit only makes a difference in low-magnitude districts.

$$ENEP_{ie} = \beta_0 + \beta_1 LogDM_{ie-1} + \beta_2 DM\ Change_{ie} + \beta_4 Election_e + \varepsilon_{ie} \quad (1)$$

$$ENEP_{ie} = \beta_0 + \beta_1 LogDM_{ie-1} + \beta_2 DM\ Change_{ie} + \beta_3 LogDM_{ie-1} \times DM\ Change_{ie} + \beta_4 Election_e + \varepsilon_{ie} \quad (2)$$

where *i* refers to the district and *e* to the election. According to electoral systems scholarship, the expectations are that $\beta_1 > 0$ and $\beta_2 = 0$ in (1) and $\beta_3 < 0$ in (2). In other words, district magnitude matters, but marginal changes in district magnitude only make a difference in low-magnitude districts. To show the robustness of our results, specifications (1) and (2) are also run using the two different measures of district magnitude. When using the dummy variable distinguishing between low- and large-magnitude districts (*Low-magnitude District* $_{e-1}$), the expectations are that $\beta_1 < 0$ and $\beta_3 > 0$ in (2) given that the value 1 is for low-magnitude districts.

We also follow an alternative strategy to examine our hypotheses. We use the difference in the number of electoral parties between two consecutive elections as dependent variable and test whether the change in district magnitude accounts to some extent for this difference. According to our argument, we should expect that *District Magnitude Change* will play a more significant role in low-magnitude districts. Specifically, the dependent variable, $DIFENEP_{ie}$ is a relative measure calculated as follows: $DIFENEP_{ie} = \frac{(ENEP_{ie} - ENEP_{ie-1})}{ENEP_{ie-1}}$. The greater the value, the greater the increase in the number of electoral parties in the current election in comparison to the previous one. We control both for election and district fixed effects. To include the latter, we used the dummy variable coded 1 if the number of seats to be allocated in a district in the previous election is five or fewer, and 0 otherwise (*Low-magnitude District*$_{e-1}$). The additive specification (3) tests whether changing district magnitude by one unit explains the difference in the number of parties, while the interactive specification (4) tests whether this effect differs between low- and large-magnitude districts.

$$DIFENEP_{ie} = \beta_0 + \beta_1 LowMag_{ie-1} + \beta_2 DM\ Change_{ie} + \beta_3 Election_e + \beta_4 District_i + \varepsilon_{ie} \quad (3)$$

$$DIFENEP_{ie} = \beta_0 + \beta_1 LowMag_{ie-1} + \beta_2 DM\ Change_{ie} + \beta_3 LowMag_{ie-1} \times DM\ Change_{ie} + \beta_4 Election_e + \beta_5 District_i + \varepsilon_{ie} \quad (4)$$

We have decided against a Difference-in-Differences (DiD) design comparing the changes in *ENEP* over time between districts where the number of seats changes (the treatment group) and those where it remains unchanged (the control group) for two reasons. First, the number of districts in the treatment group is relatively small, especially for a given district magnitude. Second, to perform the DiD design, we would need to pool data from different elections, but national fragmentation is far from stable. For example, the average district-level ENEP ranges from 4.69 in April 2019 to 2.53 in 2008. If some districts are part of the treatment group in elections where ENEP increases or drops significantly, the analysis could be biased.

Results

In Table 3, we examine our two hypotheses. In the additive model (1), district magnitude positively and significantly affects the number of parties at the 0.01% level, supporting our first hypothesis. However, changes in the number of seats allocated in the districts over time do not influence the number of electoral parties, as indicated by the lack of statistical significance. Interestingly, the interaction in model (2) is negative and statistically significant at the 0.05% level. This confirms our expectation that the effect of adding or subtracting seats on the number of parties decreases as district magnitude increases.

When using the dummy variable to separate low and high-magnitude districts in models (3) and (4), the results remain similar. In model (3), as expected, the number of electoral parties is smaller in low-magnitude districts than in high-magnitude districts; the dummy is negative and statistically significant at the 0.05% level. Again, changes in the number of seats allocated in the districts over time do not

Table 2. Descriptive statistics.

Variable	Obs	Mean	Std. dev	Min	Max
ENEP	832	3.38	0.98	1.89	6.95
District magnitude$_{e-1}$ (logged)	780	1.68	0.63	0	3.61
Low-magnitude district$_{e-1}$	780	0.56	0.50	0	1
District magnitude change	780	0.001	0.27	−1	1
DIFENEP$_{ie}$	780	0.042	0.24	−0.52	1.50

Table 3. The effect of district magnitude on the number of parties.

	Models			
	(1)	(2)	(3)	(4)
District magnitude$_{ie-1}$ (logged)	0.278*** (0.0867)	0.287*** (0.080)		
District magnitude change$_{ie}$	−0.065 (0.105)	0.565 (0.283)	−0.035 (0.105)	0.132 (0.122)
District magnitude$_{ie-1}$ (logged) × change$_{ie}$		−0.285** (0.116)		
Low-magnitude districts$_{ie-1}$			−0.343** (0.105)	−0.341** (0.136)
Low-magnitude districts$_{ie-1}$ × change$_{ie}$				0.500** (0.204)
Election fixed effects	YES	YES	YES	YES
Constant	2.676*** (0.159)	4.132*** (0.184)	4.465*** (0.161)	3.687*** (0.149)
R^2	0.528	0.530	0.526	0.529
Observations	780	780	780	780
Districts	52	52	52	52

***$p < .01$; **$p < .05$. District-clustered robust errors in parentheses.

Table 4. The effect of district magnitude on the difference in the number of parties.

	Models	
	(1)	(2)
Low-magnitude districts$_{ie-1}$	−0.012 (0.020)	−0.017 (0.020)
District magnitude change$_{ie}$	0.030 (0.017)	0.015 (0.019)
Low-magnitude districts$_{ie-1}$ × change$_{ie}$		0.074**(0.033)
Election fixed effects	YES	YES
District fixed effects	YES	YES
Constant	−0.011 (0.021)	−0.013 (0.021)
R^2	0.550	0.551
Observations	780	780
Districts	52	52

**$p < .05$. District-clustered robust errors in parentheses.

make a difference in the number of parties. In model (4), the interaction is positive and statistically significant at the 0.05% level. In other words, changing district magnitude by one seat affects the number of electoral parties in low-magnitude districts but has no impact in high-magnitude districts, aligning with our second hypothesis.

The interaction terms improve the model fit, increasing from 0.528 to 0.530 in models (1) and (2), and from 0.526 to 0.529 in models (2) and (4).

In Table 4, we used our second dependent variable, the difference in the number of electoral parties between two consecutive elections. In the additive model (1), district magnitude and the change in district magnitude do not significantly affect the fragmentation of local party systems. The model's fit is 0.55, thanks to the inclusion of election and district fixed effects. Model (2) shows that adding or subtracting additional seats makes a difference in low-magnitude districts (i.e., those allocating five or fewer seats). The interaction has the expected positive sign and is statistically significant at the 0.05 level. In sum, the results strongly support our conclusions from the previous analysis in Table 2.

Conclusions

The analysis of how district magnitude affects the number of parties has typically been approached through cross- and within-country comparisons using observational data. Despite providing relevant insights, such research designs do not allow for separating the effect of district magnitude from other concomitant variables, such as the varying social composition of districts or the regionalization of party systems. In this paper, we offer an alternative approach to assess this relationship, relying on a quasi-experiment with longitudinal data from Spain. This allows us to accurately assess the impact of district magnitude on the effective number of parties due to the marginal differences in the number of seats allocated over time.

Our results confirm the validity and strength of the current hypotheses in the literature, as we have tested them in a more controlled setting. We found that the number of electoral parties increases with district magnitude, but this increase is non-linear. Specifically, changing district magnitude by one seat only affects the number of electoral parties in low-magnitude districts, while in large-magnitude districts, the impact is negligible.

The importance of the results goes beyond the academic realm. We find that changes in the number of seats affect the number of parties in low-magnitude districts but not in large-magnitude districts. The practical consequence for electoral reform is straightforward for legislators: small changes in district magnitude will only affect the number of parties in low-magnitude districts.

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ORCID iDs

Ignacio Lago https://orcid.org/0000-0003-0611-8467
Ferran Martinez i Coma https://orcid.org/0000-0002-3486-6596

Notes

1. The results are qualitatively the same if we rely on the values for the current election.
2. The presence of a unit root in both series can be rejected at the 0.01% level.

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Author biographies

Ignacio Lago is Professor of Political Science at Universitat Pompeu Fabra (Barcelona, Spain). He holds an ICREA Academia Award (2019–2024). His recent

publications have appeared in the British Journal of Political Science, Public Opinion Quarterly, Electoral Studies, European Journal of Political Economy, European Journal of Political Research, Party Politics or Social Science Quarterly.

Ferran Martinez i Coma is Sr Lecturer at Griffith University, in Brisbane, Australia. He holds a Discovery Project from the Australian Research Council. His most recent publications have appeared in European Journal of Political Research, Party Politics, Electoral Studies or Political Behavior.