Is an Image Worth a Thousand Votes?

Evidence from a Natural Experiment in Political Advertising

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Abstract

This paper examines the causal effects of electoral campaigns on voting behavior in multi-party democracies, where voters choose among parties differing along multiple dimensions. Using novel geolocated data on street-level ads, I find that an increase in ads significantly increases a party's vote share. The impact is heterogeneous across party and voter types, being larger for new parties and candidates, and more persuasive for ideologically aligned voters. The analysis supports ad salience and informativeness as the main mechanisms underlying the effect. Finally, results also show spillover effects across parties, with ads benefiting other ideologically similar parties.

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1. Introduction

Political campaigns are a cornerstone of the democratic process, on which a substantial amount of time, effort, and money is spent. Parties strategically decide where, when, and how to advertise to maximize their vote share, which requires careful planning and execution. Moreover, modern tools have allowed parties to target small groups of voters and tailor their messages to them. As a consequence, campaign costs have reached record levels across the world.[1]

Despite its relevance, quantifying the impact of political campaigns on electoral outcomes is marred with significant methodological challenges. For instance, parties can choose where to place more ads, which ads to place, and tailor them to particular populations (Clinton and Lapinski 2004; Gottlieb and Larreguy 2020). In general, finding sources of true exogenous variation in political advertising encompassing multiple parties is rare. While existing work addressed this issue using different approaches — e.g., exploiting media overlap (Spenkuch and Toniatti 2018; Larreguy et al. 2018) and regulatory change (Avis et al. 2022; Bekkouche et al. 2022; Cagé 2020; Fouirnaies 2021) — parties nevertheless make strategic decisions on the amount of ads and who gets exposed to them. Additionally, parties running for election craft their advertising campaigns by considering their competitors' strategies, making it inherently challenging to isolate the impact of a party's own ads on voter behavior.

This paper examines the case of Spain's second-largest city, Barcelona, where street-level ads for all major political parties are randomly allocated across various locations. This unique setting allows for the identification of the main drivers of ad success that are often endogenous to campaign decisions, such as which voter groups or locations to target. Street-level ads constitute an important part of the electoral campaign period, both socially[2] and in terms of parties' expenditures, amounting to several million euros.[3] Moreover, these ads are displayed during the two weeks prior to election day and are likely the last ads that voters are exposed to before going to the polls. More broadly, street-level ads are used worldwide as a tool for political communication.

This paper makes three key contributions to the existing literature. First, it leverages the randomization of ads across multiple parties to deliver a clean identification strategy of the effects of

[1] For instance, in Brazil (Folha de São Paulo, 2018), United Kingdom (Electoral Commission, 2019), and United States (OpenSecrets.org, 2021).

[2] For instance, candidates typically attend the posting of the first street ads at the beginning of the campaign, sometimes even posting them themselves. Television news broadcasts often use this as an opening segment on the first day of the electoral campaign.

[3] Campaign expenditures are audited and then made publicly available (Tribunal de Cuentas 2017, 2020).

electoral advertising on voting behavior. Second, it assesses and provides support for two mechanisms that explain ad effectiveness: salience and information. Third, it documents heterogeneous cross-party effects of ads, examining how these depend on parties' ideological closeness.

The research design is based on exploiting the random allocation of street-level ad locations in Barcelona. To evaluate the impact of these ads, I compiled a dataset mapping the locations of street-level ads for the national elections in June 2016 and April 2019. Notably, the dataset encompasses the universe of parties that chose to have official advertising in these elections: all parties with parliamentary representation, several parties without parliamentary representation, and even parties running for the first time. Overall, these parties garnered between 1% to 27% of the votes individually and represent over 90% of the votes in Spain.

The first set of results show that a party's ads have a positive effect on its own vote share. In particular, a one-standard-deviation increase in a party's number of ads – equivalent to around 100 extra ads or being assigned an additional lottery number – would increase that party's vote share by around 0.40 percentage points. In a multiparty system in which the two most voted parties have each about 16-25% of the vote, this effect is substantial. The results are robust to different measures of ad exposure and vote shares, or considering the effects of changes in ad density across the two elections on changes in vote shares (as opposed to levels).

The second set of results provides evidence for both information provision and salience as mechanisms driving the effects of ads. While ads' informational content may seem minimal, even simple slogans can convey implicit information or prompt voters to seek more information. In order to assess this mechanism I test for specific heterogeneous effects of ad effectiveness: were ads to impact outcomes due to an informational role, their effect would be larger on less informed voters or for less well-known candidates. In line with this, the analysis reveals that the effectiveness of ads is higher in younger, less experienced voters, and lower-income populations, who are often less educated and with greater relative costs to acquiring information. Moreover, ads from both new candidates and new parties are more effective.

Political ads also work through a salience mechanism, by making parties more noticeable to voters. Indeed, increased ad exposure in an area makes voters more likely to pay attention to that party's broader campaign messages and media coverage. Then, motivated by recent theoretical work suggesting that attention capture is a natural way to increase demand (e.g. Bordalo et al. 2013, 2016; Gossner et al. 2021), I analyze the effect of ad salience on electoral outcomes. The results show that ads have a stronger effect when they are more visible or when one party's ads

crowd a given area, especially when the party controls most of the political advertising space. Banners, which are smaller but more numerous and distributed along entire street blocks, are more effective than larger posters in specific locations.

The third set of results provides evidence of cross-party effects, that is, whether a party's ads can have an effect on another party's vote share. Spain, like many other countries, has a multi-party electoral system, which renders the zero-sum logic often found in studies of advertising in two-party systems or two-round elections (Spenkuch and Toniatti 2018; Silveira and Mello 2011; Galasso et al. 2023) less straightforward, but also provides an opportunity to explore cross-party effects by ideological (dis)similarity. Ads of other parties – none of which were negative or attack ads – have a statistically significant effect on a party's vote share, but the sign and magnitude of the effect depend on the degree of ideological similarity between the different parties as well as their ideological position. Ads of parties that are ideologically distant are found to always have a negative (but not always significant) effect on a party's vote share. The effects of ads of ideologically similar parties vary between left- and right-wing parties. For the former, ads of close parties have a strongly negative effect – even larger than that of distant parties; in contrast, right-wing parties seem to benefit from ads of other close parties.

This last set of results suggests that the effects of ads could be mediated by how voters perceive future government formation, consistent with models where voters take into account possible government coalitions (Austen-Smith and Banks 1988; Baron and Diermeier 2001). I provide contextual evidence suggesting that parties had very different strategies – more adversarial or coalitional – with respect to their stance towards ideologically-akin parties in these elections. This could affect voter's behavior and explain why the ads of other parties act as substitutes or complements. I run a robustness check that provides empirical support for this mechanism.

The findings in this paper offer new insights into how political ads influence voters, opening up new avenues for research on both the strategic use of advertising by parties and its impact. They support models that highlight the informational role of ads, showing that voter responses can vary based on prior knowledge and partisanship (e.g. Baron 1994; Levy et al. 2021). In proportional systems, models of voting should also consider how ads might lead to different substitution or complement effects between parties, depending on likely government coalitions (e.g. Baron and Diermeier 2001; Buisseret and Prato 2020). All in all, welfare analyses of campaign regulations should consider how ads affect diverse groups based on their access to information and how these effects might spill over between different parties.

1.1. Literature Review

This paper contributes to three different strands of the literature: the effects of political advertising on voting behavior, the mechanisms through which ads affect voting behavior, and the spillover effects of ads.

In the first strand, the literature focuses on identifying the effects of electoral campaigns across media, including radio, TV, door-to-door canvassing, as well as mailing and phone campaigns.[4] Among these, the most clearly related paper is Larreguy et al. (2018), which studies the effects of radio ads on vote shares in Mexico. Exploiting the regulation in media coverage together with cross-state radio overlaps in the number of ads that parties can run on AM radio, they find that ads have a positive effect on vote shares, but for the two non-dominant parties only. In contrast, I consider street-level ads, whose location is randomized for all major parties, allowing for a clean identification strategy. In the context of this paper, with a competitive multi-party system where no party exceeds 25% of the vote, parties could significantly benefit from small increases in ad exposure.

A second related literature has focused on the content of the ads as a potential mechanism to explain their effect on voting behavior, especially when ads contain ideological cues (Green et al. 2016) or explicit references to candidate characteristics such as valence and competence.[5] For instance, Kendall et al. (2015) designed two different campaign ads for an incumbent mayoral candidate in an Italian city, emphasizing either valence or ideology. Increased ad exposure boosted the incumbent's vote share by four percentage points, but only in precincts where voters were contacted by phone and ads highlighted the candidate's valence. This paper contributes to this literature by testing and providing evidence for two mechanisms through which ads may affect voter behavior: salience and voter information.

Finally, this paper contributes to the literature on the spillover effects of political advertising. Most of these studies analyze negative advertising – ads attacking another party – and, in particular, whether it depresses turnout. While existing literature is inconclusive as to whether negative ads depress overall turnout or bolster it (see Ansolabehere and Iyengar 1995; Barton et al. 2016; Lau and Rovner 2009), it has found spill-over effects on other parties' vote shares. Specifically,

[4] For instance, Durante and Guitierrez (2014); Kalla and Broockman (2018); Le Pennec and Pons (2023); Pons (2018); Sides et al. (2022); Silveira and Mello (2011).

[5] Ashworth and de Mesquita (2009); Barbanchon and Sauvagnat (2022); Bernhardt et al. (2011); Casas-Arce and Saiz (2015); Dal Bó et al. (2017); Kartik and McAfee (2007).

Galasso et al.'s (2023) results from field experiment conducted during the campaign for mayoral election in an Italian city show that negative ads benefited the candidate who neither used nor was the target of such ads. While in this paper, ads do not feature attacks towards other parties, the competitive nature of the elections makes it plausible that spillover effects would occur. The results reveal a more complex pattern of substitution and complementarity, suggesting that, depending on the ideological distance between parties, ads of other parties can have a positive or negative effect on a party's vote share.

The remainder of the paper is organized as follows: Section 2 summarizes the key elements the regulation of electoral campaigns in Barcelona and Section 3 describes the datasets used. Section 4 details the main aspects of measuring ad exposure and the identification strategy used. The following three sections present the main results: Section 5 discusses the average effects of ads, Section 6 explores the mechanisms driving these effects, and Section 7 focuses on the spillover effects of ads. Finally, Section 8 considers other heterogeneous effects and robustness checks and Section 9 concludes.

2. Background and Framework

2.1. Electoral Advertising in Spain

Campaign regulations in Spain impose strict restrictions on ad placement, timing, and quantity across most media formats.

By law, street-level advertising for political parties must adhere to two principles: (i) all parties or coalitions requesting ad space must be accommodated, and (ii) the ad space awarded to each party should be proportional to their vote share in the most recent comparable election within the relevant district. Municipalities can determine their ad allocation method as long as it adheres to these two principles. The particular allocation method followed in Barcelona is discussed in Section 4. Note that, although the proportionality rule is known among voters as it is a requirement for all types of electoral ads, the specific allocation scheme of street-level ads is not.[6]

[6]That is, voters in Barcelona are not aware the ad locations are being randomized. Based on discussions with campaign organizers and townhall officials countrywide, municipalities decided on their allocation method in 1985, when the law regulating elections was enacted, and have not changed it since.

The allocation of street-level advertising spaces involves the municipal administration and the Junta Electoral de Zona (JEZ), representing the electoral commission. The municipal administration provides a list of available spaces to the JEZ and all parties.[7] Parties notify the JEZ of their interest by a set deadline. Allocation occurs 10 to 14 days before the campaign, with representatives from all parties, the administration, the JEZ, and a notary present.

Street-level ads are divided into two types: posters and banners. Posters are large and are placed on the walls of buildings or on freestanding structures that otherwise host commercial ads – an example can be found in Figure OA.6. They are often placed in a square or at the intersection of two streets. Banners are smaller and are placed on streetlights – an example can be found in Figure OA.5. They are allocated in street segments, which are typically at least 250m long. Each segment can host at least 20 banners and only one party is allowed to place banners in a given segment. In most cases, ads only feature a picture of the candidate, the party's name, and the party's slogan for that election.

Once the ads are allocated to the parties, they face no specific restrictions with respect to the content of the ads. The campaign's overall design and slogan are set at the national level up to the use of regional languages in the ads, such as Catalan, instead of Spanish. All parties have very similar ads in terms of structure and content – see Figure OA.7 for examples of banners. Parties usually have a set of 2 to 6 different banner designs, which often feature the party's candidate for prime minister as well as the party's top candidate in that electoral district. Parties place the different designs sequentially on the street segments, with each design being allocated to one streetlamp. Hence, all voters in an area exposed to ads from a particular party see all of its ad designs. Regarding posters, parties also have a limited number of designs. Since the size of posters is larger than that of banners, some but not all the posters will contain an additional slogan. Posters are often placed on billboards that are used for commercial advertising outside the electoral period.

The campaign period is limited to 15 days, ending at midnight the day before the election. All campaign activities, including advertising, are banned thereafter. These ads remain in place throughout the campaign, providing sustained exposure, and making them the last ads voters will see in the 48-hour period before the election. A significant share of voters often decide their vote during this period (e.g Le Pennec and Pons 2023), around 25% in the elections in our sam-

[7] For evidence that the mayor's party likely did not manipulate ad locations, see the Appendix A.

ple.[8] The brief campaign duration and repeated exposure to nearby ads could have a large impact on voters (Gerber et al. 2011). For a more detailed description of the regulatory framework for electoral campaigns in Spain, refer to Online Appendix A.

2.2. Electoral Competition in Barcelona

Out of the parties that had ads in Barcelona in 2016 and 2019, there are four country-level parties that ran in both elections: Ciudadanos (Citizens, Cs, liberal), En Comú Podem (Together We Can, ECP, left), Partido Popular (People's Party, PP, center-right), and Partit dels Socialistes de Catalunya (Party of the Socialists of Catalonia, PSC, center-left).[9] VOX (extreme right), created in 2013, also ran in the 2019 Barcelona elections for the first time.

Two regional parties with significant influence in local politics participated in both elections and also had ads: Convergència Democràtica de Catalunya (Democratic Convergence of Catalonia, CDC, center-right) and Esquerra Republicana de Catalunya (Republican Left of Catalonia, ERC, left). While regional parties may not match the main national parties in votes, they still garner enough votes to secure MPs. This often results in regional parties supporting the leading party to form a government when it falls short of a majority.

Two other parties in Barcelona had ad space in at least one election but did not obtain representation in the national parliament.[10] Five more parties competed in the Barcelona district in at least one election. These parties received limited support, often falling short of blank votes, and likely didn't request ad space due to associated costs.[11]

Overall, the parties included in my sample include all parties represented in parliament[12], three parties that ran for the first time in 2016 or 2019, and two parties that did not obtain representation in the national parliament. More details regarding the Spanish party system can be found in Online Appendix A.

[8] Source: Centro de Investiaciones Sociológicas (2016). *Postelectoral Elecciones Generales 2016*, No. 3145; Centro de Investiaciones Sociológicas (2019). *Postelectoral Elecciones Generales 2019*, No. 3248.

[9] Note that these are the names these parties use to run in the electoral districts in Catalonia.

[10] Front Republicà (Republican Front, FRONT) and Partit Contra el Maltractament Animal (Animalist Party Against Mistreatment of Animals, PACMA).

[11] None of these seven parties have representation in the regional parliament or in the city councils in the district of Barcelona.

[12] Excluding regional parties that *do not* run in Barcelona, such as the Basque Nationalist Party (PNV).

3. Data

This section outlines the data used: electoral results, information about the location and distribution of political advertising at the street level, as well as demographic and economic variables.

Advertising data. The main dataset used in this paper includes the location of electoral ads in the city of Barcelona for the 2016 and 2019 national elections. The data was provided by the Barcelona townhall and by ERC.[13] In order to map the information on the location of ads, I also use the outline of the city of Barcelona and its census sections provided by the Instituto Nacional de Estadística (INE). The census section, the unit of analysis, is the smallest administrative division in Spain and its geometry is determined by the population registered in the most recent Decennial Census, which, in this case, took place in 2011. There are 1068 census sections in Barcelona, containing between 400 and 2400 people each, with an average population of around 1000. Since I only focus on the effect of ads in the 2016 and 2019 national elections, there are no changes in the census sections to consider.[14]

Election data. Voting data at the voting booth level is avaialble for the April 2016 and 2019 general elections. The dataset contains information on the overall population, the number of people registered to vote, voter turnout, and the distribution of votes, whether they were blank, null, or in favor of a specific party.[15] In most cases, each section is assigned to a single voting booth.[16]

Other data. I also use socio-demographic information from the Atlas de la Renta, a project within INE that uses data from tax returns of the years 2015 to 2019. It contains indicators relating to income and its distribution within the census section, as well as different income sources. It also has demographic indicators at the census section level related to the age distribution and size of households. I also use data provided by the municipality of Barcelona on air quality across the streets of Barcelona in 2016 and the census of all street-level shops in 2016 and 2019. More detailed information on the data can be found in Online Appendix B.

[13] Although the data provided by these two different sources do not cover the exact same elections, there is some overlap, which allowed me to verify that the reported assignment on both documents is the same.

[14] There are four sections that had minor border adjustments between 2016 and 2019. Two do not include any changes in terms of residential areas, one includes some scattered houses and the last one includes a full (newly built) apartment complex. All in all these changes should not affect much the population within those sections.

[15] All Spanish citizens are automatically registered as voters when they turn 18 or when obtaining the nationality.

[16] When the section is deemed to have too large a population, it is assigned to two or more voting booths. Voters within that section are allocated to the different booths by alphabetical order of their surnames and first names.

Table 1. **Distribution of Street-Level Ads in Barcelona (2019)**

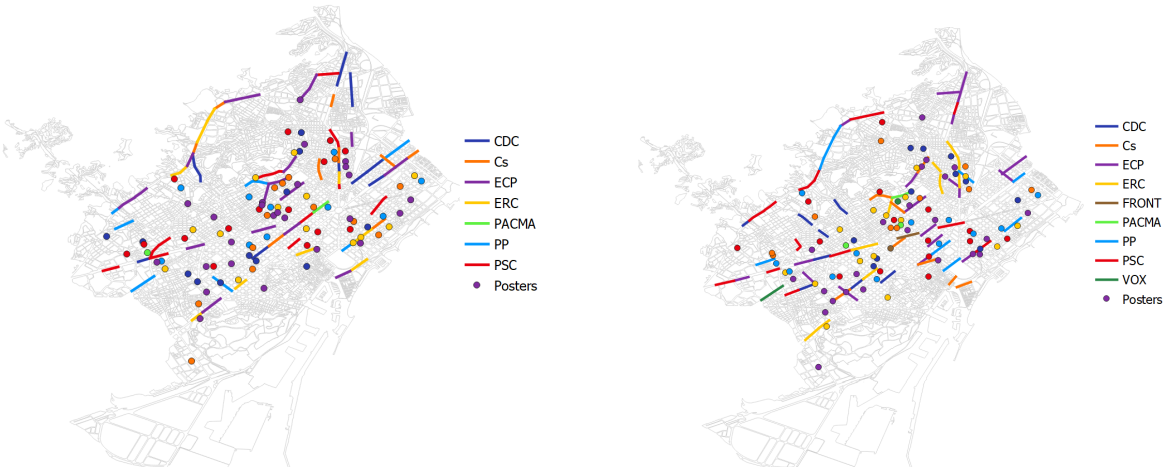
	ECP	PSC	ERC	PP	CDC	Cs	PACMA	FRONT	VOX	Total
Banners (N)	1604	954	1070	660	531	742	98	78	90	5827
Banners (%)	27.53	16.37	18.36	11.33	9.11	12.73	1.68	1.34	1.54	
Segments (N)	18	12	11	9	8	8	1	1	1	69
Segments (%)	26.09	17.39	15.94	13.04	11.59	11.59	1.44	1.45	1.45	
Posters (N)	23	15	15	12	11	10	2	1	1	90
Posters (%)	25.56	16.67	16.67	13.33	12.22	11.11	2.22	1.11	1.11	
2016 Votes (%)	25.68	16.84	16.56	13.54	12.26	11.53	1.80	—	—	
2019 Votes (%)	16.31	24.66	22.97	5.00	10.15	11.98	1.62	2.72	3.59	

Notes: The distribution of the electoral campaign space is for the 2019 general election, held in April. The electoral results refer to the previous comparable election, which was held in April 2019. ECP stands for "En Comú Podem" (Together We Can), PSC stands for "Partit dels Socialistes de Catalunya" (Party of the Socialists of Catalonia), ERC stands for "Esquerra Republicana de Catalunya" (Republican Left of Catalonia), Cs stands for "Ciutadans" (Citizens), CDC stands for "Convergència Democràtica de Catalunya" (Democratic Convergence of Catalonia), PP stands for "Partido Popular" (People's Party), PACMA stands for "Partit Animalista Contra el Maltractament Animal" (Animals' Party Against Mistreatment of Animals), FRONT stands for "Front Anticapitalista" (Anticapitalist Front), and VOX is the actual name of the party.

As explained in Section 2, parties are assigned a number of ad locations in proportion to their results in the previous comparable elections. Tables 1 and A.6 show the allocation of both types of ads – banners and posters – across parties for the 2019 elections and 2016 elections, respectively.[17] The two tables show that, indeed, for both types of ads, the percentage of ads allocated is very close to the results in the 2015 elections in the case of the 2016 allocation, and the 2016 elections for the 2019 allocation. Note that due to the random allocation of segments, it so happens that a party with more segments has fewer banners than a party with fewer segments.

Figure 1 shows the distribution of ads across the city of Barcelona for the 2019 and 2019 elections. Although ads are spread across the city, there are some areas with a higher concentration of ads than others. In particular, areas in the outskirts of the city as well as the dockyards have a lower concentration of ads. Areas with narrow streets also have fewer ads due to logistical constraints. For the same reason, long and wide streets feature several ad segments. Overall, there is a large overlap in the locations chosen to display ads between the two elections.

[17] Because 2016 was a repeat election, one of the parties decided to not have any street-level ads at all. This affected all municipalities in the country. These are excluded from the analysis, which means that there are fewer observations in 2016 than in 2019. More details can be found in Appendix A and Online Appendix B.



(a) **2016** (b) **2019**

Figure 1. **Location of Electoral Advertising in the 2016 and 2019 General Elections in Barcelona**

Notes: The lines denote the segments of streets allocated to different parties, where each party has a different color. Dots denote the posters by each party. Note that, due to a decision made by the party, PSC did not run any ads in 2016 throughout Spain. Their allocated segments were left empty but are still shown in this map.

4. Empirical Strategy

4.1. Measuring Ad Exposure

To measure ad exposure, ads are given a precise location by converting the original address information into geographic coordinates for both banners and posters. For banners, I assume that they are equally spaced within street segments – similar to the placement of lamp posts in the city – and for posters, that they are placed in the center of the intersection.

Once the ads are located, the next step is determining which local ads voters living in a section will be most likely to be exposed to. Census sections are typically quite small, covering approximately 1% of the city's area on average. Therefore, it's reasonable to assume that voters are exposed to ads within walking distance of their section. To account for this, I create a 500-meter buffer around each section to define its area of influence, corresponding roughly to the perimeter of an average-sized block. As a robustness check, I will also use buffers from 300m to 450m for the main results of the paper. Figure OA.8 illustrates how buffers are constructed.

Next, I focus on one measure of exposure to electoral ads, ad density. I define ad density as the number of ads within a given section and buffer area divided by its total area – which includes

the buffer area too. I transform this variable so that it can be interpreted as the number of ads per $100m^2$ (around 1076 sqft). This is an absolute measure of the amount of advertising in a given area that also takes into account that the concentration of ads may differ as the size of the areas is not homogeneous.

4.2. Identification Strategy

This section discusses the methodology used to estimate the causal effect of electoral ads on vote shares. The identification strategy relies on the randomization of ad locations across parties ahead of each election.

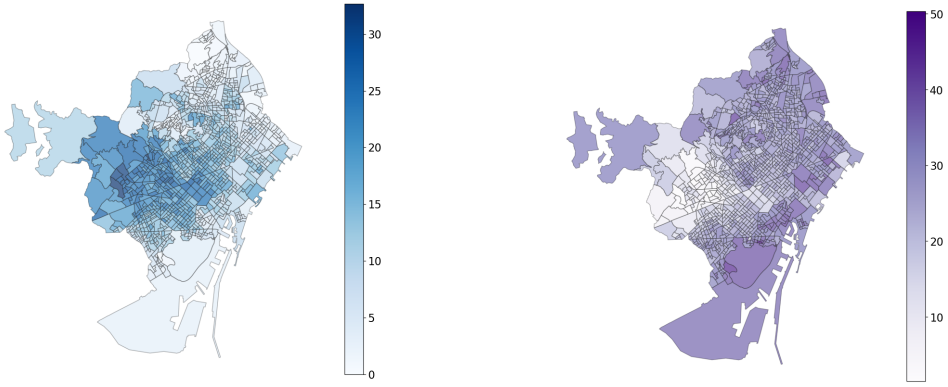
In Barcelona, two separate lotteries are held for each type of advertising – posters and ad banners – matching the parties' lottery tickets to ad locations. Posters are allocated individually while banners are allocated in street segments.[18] Once the allocation is done there cannot be any ex-post trading of locations, parties cannot put up ads in locations attributed to another party, nor in any other space that may have remained empty.[19] An example of how these ads are displayed on the street can be found in Figure OA.5.

The randomization occurs at the party level, where each party is assigned a number of ad locations in proportion to its vote share in the previous comparable election. Instead, the locations available to host ads is pre-determined by the municipality. Thus, within sections with at least one poster or banner segment, the party assigned to a specific spot is random.

Overall, it is extremely unlikely that parties target the content of the ads, or any other campaign activities, based on the lottery outcome. Based on interviews I conducted with officials of several parties running in these elections and to the best of my knowledge, it did not happen. There is one party who chose to not have any street-level ads at all in 2016; this was a last-minute decision made at the national level to reduce campaign costs and it affected all municipalities, making it unlikely that this was a strategic decision based on the outcome street-level ad randomization in Barcelona. I found no evidence that any of the other parties made a similar decision in either election. For a discussion on whether parties could have reacted strategically to the lottery outcome, see Appendix A.

[18] For instance, a party would be given Street A, starting at its intersection with Avenue X up until its intersection with Avenue Y, which contains β banners. Banners are placed on lamp posts. Outside the electoral period, banners in lamp posts are used to advertise municipal initiatives as well as cultural activities. They can also be left empty.

[19] It is customary to leave one to two ad locations empty in case a party decides to protest the allocation. This did not happen in any of the elections considered in this paper.



(a) **CDC (2016)** (b) **ECP (2016)**

Figure 2. **Vote Shares of CDC and ECP (2016)**

In order to account for spatial correlation, I estimate Conley standard errors (Conley 1999) as well as standard errors clustered at the section level in all regressions.[20] As can be seen in Figure 2, there is a large variance in the vote shares of a given party across sections. However, it is also apparent that if two sections are nearby, it is more likely that there is a smaller difference in a party's vote share between those sections. Moreover, as mentioned before a majority of the ads, banners, are divided into segments. The segments' length can be as short as 250m (820 ft) to over 1km (0.630 miles). This means that sections that are nearby are likely to be exposed to similar distribution of ads.

The main specification is as follows:

$$\text{VoteShare}_{i,p,e} = \beta \text{AdDensity}_{i,p,e} + \psi_i + \pi_{e,p} + \varepsilon_{i,p,e} \tag{1}$$

Where $\text{VoteShare}_{i,p,e}$ refers to the vote share of party p in section i in election e, $\text{AdDensity}_{i,p,e}$ refers to the number of ads per 100m^2 of party p within the perimeter of influence of section i for election e, ψ_i denotes section fixed-effects, and $\pi_{e,p}$ are election-year fixed effects.

The main sample used in the analysis consists of the sections with a positive number of ads. This is because which streets and intersections host ads is determined by the municipality, only then followed a random allocation of these spots among parties. Moreover, I include section

[20] I estimate these standard errors by using the 'econtools' package for Python, a bandwidth of approximately 280m with a triangular kernel.

fixed effects to control for section-specific unobserved characteristics.[21] When it is not possible to include section fixed effects, I include a set of socio-demographic variables in the regression as controls as well as the total number of ads. I also include party fixed effects or party-year fixed effects when considering the data for the two elections. This is to account for party-specific characteristics as well as party-specific time trends (e.g. changes in party leadership or party platform).

Randomization-inference p-values are computed for the main results as a robustness check. I use the randomization device used in the allocation to simulate 10000 potential assignments of the ad locations across parties. Using the new random assignments, I compute, for each permutation, the number of ads of a given party that each section would be exposed to in this hypothetical scenario. Then, I run the same regression on the permutation dataset and derive randomization-inference p-values. For more details, see Online Appendix C.

Finally, I check on the randomization of ad location across parties with balance tables (see Online Appendix E). I compare section characteristics between (i) the first and second most voted parties and (ii) left-wing and right-wing parties. Variables include income distribution, income sources, age, population, household size, shop density, and turnout in the 2015 national election. Whenever possible, I use values from the year preceding either of the two elections (2015) or the election year (2016 and 2019). I conduct t-tests for group differences and calculate randomization-inference p-values (p^{RI}). For the most part, the differences are small and not statistically significant. When comparing the first and second most voted parties, the only variable with a $p^{RI} < 0.10$ is share of population over 64 in 2019, with a difference of 0.6 percentage points – as a reference point, the standard deviation if around 4.5 percentage points. When comparing left-wing and right-wing parties, the only variables with a $p^{RI} < 0.10$ are sections with low shop density (2016) and some income variables (2019). Again, the differences are nevertheless small relative to standard errors and comparable to group differences in between the first and second most voted parties.

5. Effects of Ads on Vote Shares

This section examines the impact of a party's own ads on its vote share.

[21] There are several other parties that ran in these elections but are not included because they did not have ads. Vote shares also include blank votes. Therefore, it is unlikely that the vote shares of the parties with ads would sum up to one or equal the same share over total votes across sections. Moreover, the results hold when section fixed effects are replaced by socio-economic control variables and the total number of ads, as will be shown later.

Table 2. **Effects of Own Ad Density on Vote Shares**

	Vote Shares		
	2016–2019	2016	2019
	(1)	(2)	(3)
Ad Density	0.952***	0.843**	1.158***
	(0.150)	(0.305)	(0.161)
	[0.187]	[0.360]	[0.193]
	{0.078}	{0.349}	{0.026}
R^2	0.73	0.63	0.79
Observations	14472	5670	8802
Mean of Outcome	12.19	14.09	10.96
Section FEs	Yes	Yes	Yes
Party FEs	–	Yes	Yes
Party×Year FEs	Yes	–	–

Notes: Ad density refers to the number of ads in 100m^2. There are section and party fixed effects, and column (3) has year and party-year fixed effects. Results shown using the 500m perimeter of influence. Standard errors are clustered at the section level and are reported in parentheses. Conley standard errors are reported in squared brackets. Randomization inference p-values are in curly brackets. Significance stars are reported with respect to Conley standard errors. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table 2 displays the results of estimating Equation 1 for sections with at least one ad, analyzing the two elections separately and combined.[22] Moreover, $p^{RI} < 0.10$ for both 2019 and the two elections pooled. Robustness checks are discussed in Section 8.

The results presented show that campaign ads matter and have a positive effect on a party's electoral performance. In general, whereas the related literature has found that campaign ads have a positive effect on vote shares, studies on street-level ads often find a null effect for partisan and Get Out the Vote (GOTV) campaigns (Green et al. 2016, 2024). This is perhaps because these are lawn signs in residential areas in the United States. Ad density in this context is much lower than in the case of street-level ads in Barcelona – and in other cities around the world. Moreover, voters are more likely to spend time walking around their neighborhood, and hence being exposed to ads. I conjecture that this would also be the case for other cities where the population density is high and people walk more. This paper explores both hypotheses in Section 6.

[22]Note that the difference in the number of observations between the two elections is due to the fact that one party decided not to have any street-level ads in the 2016 elections across all Spanish municipalities, as mentioned in Section 4 and Online Appendix A.

To approximate the overall effect across the city, I do a back-of-the-envelope calculation using the results from the regression using the number of ads instead of ad density (Table OA.15). The estimated coefficient in column (3) can be interpreted as one additional ad in a given section increasing by 0.007 the vote share of that party. An additional slot – combining both banners and posters – contains between 23 and 213 additional ads. Therefore, if a party were given an additional slot in each lottery, their vote share would increase between 0.16 and 1.49 percentage points. A one standard deviation increase in the number of ads (around 58 ads) would increase a party's vote share by around 0.40 percentage points. This is a large effect, especially considering that the average vote share of the parties with ads is around 13%. This estimate is slightly lower, but in line with Spenkuch and Toniatti (2018), where one standard deviation increase in the number of ads (22 TV ads) increases a party's vote share by 0.5 percentage points.

6. Evidence on Mechanisms: Salience and Information

6.1. Information

Ads can provide voters with information about a party's platform and candidates. Even though the ads in this study typically only include a slogan and the candidate's name, they may convey implicit information through symbols and images (e.g. Mullainathan et al. 2008; Caprini 2023), or prompt voters to seek more information. If information is one of the mechanisms explaining the effect of ads on vote shares, less informed voters would likely be more influenced by ads. This aligns with both empirical and theoretical research suggesting that information affects voting and party choices (Ashworth and Bueno de Mesquita 2014; Baron 1994; Cruz et al. 2021), and Zaller's (1992) theory that political awareness correlates with stable political views.

To test this hypothesis, I consider two proxies for information. First, I consider heterogeneous effects across areas with different average age or income, as older and wealthier voters are likely more informed. Second, new parties and candidates, which may benefit more from ads as they are less known.

I examine whether socio-demographic characteristics of areas affect ad effectiveness. Using data from INE's *Atlas de la Renta*, I create binary indicators for income and household age, indicating if a section's average is above or below the city's median. These are included as interactions with ad density to test their impact on vote share.

As shown in Table 3, interaction coefficients for income and age are significant at the 1% level. The results show that ad density is less effective in areas with higher income or older populations. For example, a one unit increase in ad density increases vote share by 1.72 percentage points in lower-income areas versus 0.62 percentage points in higher-income areas.

I define parties as new if they first ran in 2015 or later, including Podemos, Ciudadanos, and VOX (in 2019). Table A.12 shows that the interaction term for left and new parties is positive and significant, suggesting that less familiar, new parties benefit more from ads. I also consider new candidates – first election they ran for office was at most within the last four years – and find that ads featuring new candidates are more effective (Table A.13).

Table 3. **Ad Density and Socio-Demographic Characteristics (2016–2019)**

	Vote Share		
Ad Density	2.322***	1.716***	1.611***
	(0.292)	(0.262)	(0.194)
	[0.313]	[0.280]	[0.232]
	{0.013}	{0.028}	{0.043}
Ad Density × Above Median Income	-1.539***	–	-1.572***
	(0.262)		(0.264)
	[0.288]		[0.294]
	{0.056}		{0.053}
Ad Density × Above Median Age	-1.041***	-1.097***	–
	(0.284)	(0.286)	
	[0.285]	[0.286]	
	{0.093}	{0.089}	
R^2	0.73	0.73	0.73
Observations	14472	14472	14472
Section FEs	Yes	Yes	Yes
Party×Year FEs	Yes	Yes	Yes

Notes: Ad density refers to the number of ads per $100m^2$ of party p in section i. Ad density × Above Median Income refers to the interaction between Ad Density and a binary variable indicating whether the section is above or below the median income of treated section. Ad density × Above Median Age refers to the interaction between Ad Density and a binary variable indicating whether the section is above or below the median average household age of treated section. Heteroskedasticity-robust standard errors are shown in parentheses and Conley standard errors are reported in brackets. Randomization inference p-values are in curly brackets. Significance stars are reported with respect to Conley standard errors. Results shown using the 500m perimeter of influence. ***: $p < 0.01$, **: $p < 0.05$,*: $p < 0.10$.

6.2. Ad Salience

Salience may make voters more receptive to a party's messages, influencing their voting decisions (e.g. DellaVigna and Kaplan 2007; Bidwell et al. 2020; Le Pennec and Pons 2023). I test this hypothesis by using three measures of ad concentration: (1) comparing banners to posters, as banners may be more salient due to their number and visibility; (2) examining exposure to ads from a single party versus multiple parties; and (3) analyzing areas with differing levels of ad concentration.

I consider ad shares by terciles within a section, creating binary variables for parties with less than one-third, between one and two-thirds, and over two-thirds of ads. The results in Table 4 indicate that having over two-thirds of ads significantly increases vote share compared to having less than one-third, whereas having between one and two-thirds offers no significant advantage. I also consider the effect in areas that only saw ads from a single party. The results in Table A.11 show that exposure to ads of a single party increases that party's vote share by 1.3 percentage points, though the effect is not significant in 2016.

Barcelona's street-level advertising includes banners and posters. Estimating the model in Equation 1 for the two types of ads separately shows that banners account for most of the ad density effect on vote shares (Table A.9). This supports the role of salience, as banners, though smaller, are more numerous and occupy several blocks.

Another key factor related to salience is whether voters walk in the area frequently enough to be exposed to street-level ads. Since detailed foot-tracking data is unavailable for Barcelona, two proxies are used: environmental pollution and shop density from the town hall's open data portal. Higher pollution levels are likely in areas with more car traffic, where locals are more likely to walk.[23] Similarly, areas with a higher shop density are more likely to be residential and have more foot traffic.[24]

Overall, the interaction terms show that ads are not less effective in areas with low shop density, but they are weakly more effective in areas with high air pollution (Table A.10). For instance, in

[23] Pollution is measured by a section's maximum nitrogen dioxide (NO_2) emission. If it exceeds $65\mu g/m^3$ – the World Health Organization recommends annual exposure below $10\mu g/m^3$ – the area is marked as high pollution.

[24] I use the number of ground-level shops per $100m^2$ as a measure of amenity density. This includes only shops useful to residents, excluding wholesale or souvenir shops. A binary variable is created for areas with shop density below the 20th percentile of the city's distribution and is interacted with ad density.

Table 4. **Ad Concentration and Vote Shares (2016–2019)**

	Vote Share		
	2016-2019	2016	2019
(1/3, 2/3) Ads	0.026	0.064	0.072
	(0.184)	(0.383)	(0.210)
	[0.200]	[0.399]	[0.221]
	{0.487}	{0.313}	{0.477}
≥ 2/3 Ads	1.019***	0.174	1.763***
	(0.225)	(0.420)	(0.251)
	[0.253]	[0.443]	[0.281]
	{0.102}	{0.478}	{0.031}
R^2	0.73	0.63	0.79
Observations	14446	5649	8797
Section FEs	Yes	Yes	Yes
Party FEs	–	Yes	Yes
Party×Year FEs	Yes	–	–

Notes: [1/3, 2/3) Ads is a binary variable equal to 1 if the party has between one third and less than two-thirds of the ads in the area and 0 otherwise. ≥ 2/3 Ads is a binary variable equal to 1 if the party has at least two-thirds of the ads in a given area. Results shown using the 500m perimeter of influence. Heteroskedasticity-robust standard errors are reported in parentheses. Conley standard errors are reported in squared brackets. Randomization inference p-values are in curly brackets. Significance stars are reported with respect to Conley standard errors. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

areas with high levels of pollution an additional unit increase in ad density increases vote shares by around 0.9 percentage points.

In summary, the results suggest that ads work through a salience mechanism by capturing the attention of voters even with low information ads (Gossner et al. 2021).

7. Cross-Party Effects of Ads

Voters are exposed to ads from multiple parties across various media platforms, including street-level advertising, TV, radio, and social media. Hence, assessing the impact of these competing ads on a party's vote share is important, particularly regarding how ideological proximity influences this effect.

To measure ideological distance, I use the parties' position within the traditional left to right spectrum with survey data. The data is from the 2016 and 2019 Pre-electoral and Post-electoral

surveys conducted by the Centro de Investigaciones Sociológicas (CIS). These in-person surveys were carried out in the two weeks prior to the start of the campaign and in the weeks following the elections, respectively.[25] In the 2016 and 2019 surveys respondents are asked to place themselves in the left-right wing spectrum, where 1 means the most left-wing and 10 the most right-wing. They are also asked to use this same scale to place a group of political parties.[26]

While the left-right spectrum effectively characterizes a party's platform, multiple policy dimensions often contribute to a party's ideology and platform. Hence, I also use the parties' location in their perceived stance on the territorial organization of Spain, which has been a topic of notable relevance in the recent past.[27] This 'regionalism' scale takes a value of 1 if the party has a negative stance on regional identities and favors centralization and 10 if it has a strong regional identity and is in favor of the independence of a given region.

Figure 3 shows the average location of the seven main parties in both 2016 and 2019. According to the respondents' assessment, parties seem to be spread out throughout both dimensions. For instance, there are both left-wing and right-wing parties with a low regionalist score. Note that there are two parties with ads that the survey does not include, PACMA and Front Republicà. These are small parties that do not have representation at the national or local level.

Parties are categorized as close or distant based on survey data and their distance across both dimensions.[28] This definition, rather than a more traditional left-wing group versus right-wing, allows for parties to have a different set of close or distant parties depending on their own position.

[25]Respondents were selected through stratified random sampling to represent all electoral districts in Spain. Only the sub-sample from Barcelona, comprising over 600 respondents each year, is used due to regional variations in party ideology perception.

[26]Usually, only parties represented in parliament are considered. Exceptions are made when the political party is expected to gain representation in the upcoming elections. In this case, the surveys covers 6 out of the 9 parties in the sample.

[27]This question was only asked in the 2016 post-electoral survey. This means that I have no estimate for where VOX, which was not represented in the Spanish parliament in 2016, is located on this particular scale. For 2019, I assume that VOX is more extreme in its views than the party with the most extreme position I do have data for the regionalism scale, PP, and impute the minimum value in that scale, 1. PP's average perceived position was 1.36 in 2019. For the 2019 elections, VOX's electoral program proposed a centralized organization of Spain where there is a single national parliament and regions have no sector-specific competencies. This is a stance that is not shared by any other party represented in the Spanish parliament.

[28]Party q is considered close to party p if the average ideological positions differ by no more than a particular threshold, which was chosen to ensure that each party would have at least one close and one distant party.

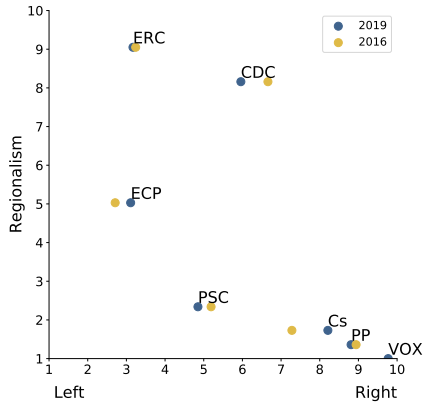


Figure 3. **Location of parties in the Regionalist and the Left-Right dimensions**

These indicators create two variables relating to the ad density of close and distant parties.

$$\text{VoteShare}_{i,p,e} = \beta\,\text{AdDensGroup}_{i,p,e} + \pi_p + \psi_i + \tau_e + \pi_p \times \tau_e + \varepsilon_{i,p,e} \tag{2}$$

where $\text{AdDensityGroup}_{i,p}$ refers to the number of ads per 100m^2 of party p's close parties or distant parties, π_p denotes party fixed effects, ψ_i denotes section fixed-effects, τ_e election fixed effects.

The impact of other parties' ads changes when considering left- and right-wing parties separately.[29] As shown in Table 5, while the effect of distant parties' ads remains negative (though not always significant), the effect of close parties' ads differs depending on whether a party is left- or right-wing. For left-wing parties, the ads of close parties continue to have a negative and significant effect, whereas for right-wing parties, they have a positive effect.[30] This pattern suggests that voters may have engaged in coalition-type thinking for right-wing parties, viewing close parties not as competitors but as potential allies. An increase in ads from ideologically similar parties might foster the perception of a group of parties capable of implementing policy initiatives post-election.

Evidence suggests that coalition signals play a role in voting decisions (Bahnsen et al. 2020; Gschwend et al. 2017), which could explain these results. Overall, in both elections left-wing parties adopted a more competitive stance, partly due to the emergence of a party to the left

[29]When combining all parties together, the effects of other parties' ads always act as substitutes (Table A.8). The coefficients are negative and statistically significant when estimating the effect of close and distant parties when included together, and the effect of ads of distant parties remains statistically significant on its own. However, the effects are not statistically significant when looking at p^{RI}, which is always above .10, except for the effect of the ads of close parties in column (3).

[30]Note that $p^{RI} > 0.1$ for all columns of Table 5, except for the Ad Density of close parties in column (3).

Table 5. **Effects of Own and Other Party's Ad Density on Vote Shares (2016–2019)**

	Vote Share					
	Left-Wing Parties			Right-Wing Parties		
	(1)	(2)	(3)	(4)	(5)	(6)
Ad Density Close Parties	-0.851***	–	-1.085***	0.333**	–	0.149
	(0.151)		(0.171)	(0.138)		(0.113)
	[0.165]		[0.191]	[0.167]		[0.128]
	{0.140}		{0.095}	{0.279}		{0.276}
Ad Density Distant Parties	–	-0.270	-0.686***	–	-0.345*	-0.284
		(0.164)	(0.186)		(0.154)	(0.154)
		[0.187]	[0.213]		[0.188]	[0.187]
		{0.312}	{0.215}		{0.256}	{0.230}
Observations	4824	4824	4824	6747	6747	6747
R^2	0.53	0.53	0.53	0.67	0.67	0.67
Section FEs	Yes	Yes	Yes	Yes	Yes	Yes
Party×Year FEs	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Ad density refers to the number of ads of a party p in 100m^2. Ad density Close Parties refers to the number of ads of parties that are no more than 4 points away from party p using both scales. Left-wing parties are ECP, ERC, and PSC. Right-wing parties are CDC, Cs, PP, and VOX. Results shown using the 500m perimeter of influence. Heteroskedasticity-robust standard errors are reported in parentheses. Conley standard errors are reported in squared brackets. Randomization inference p-values are in curly brackets. Significance stars are reported with respect to Conley standard errors. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

of the traditional center-left party in Spain. This new party was firmly anti-establishment and posed a serious electoral threat to the center-left. As a result, the new left-wing party adopted a more belligerent stance against the center-left party, and vice-versa.[31,32] Conversely, the main center-right party faced competition from a liberal party and extreme right-wing party (in 2019), but both appeared open to a post-election coalition.[33]

To lend support to this mechanism, consider the intra-group distance within close parties. Voters are more likely to expect parties that are closer to each other in the ideological spectrum are more likely to form a coalition. In Figure 3, the perceived distance between left-wing parties is larger than that of right-wing parties. Hence, it would be more plausible to expect right-wing parties to form a coalition than left-wing parties. I divide parties based on whether they are closer or further

[31] El País (2016/06/06), ABC (2019/09/20), La SER (2019/11/13).
[32] Note that the April 2019 elections resulted in a hung parliament, where the left-wing parties were unable to agree to form a government.
[33] El Confidencial (2016/05/04), El País (2019/03/27), El País (2019/04/05).

away from the average distance to other parties to their group of close parties and estimate the model akin to Equation 2. The results are consistent: parties whose group of close parties is relatively dense benefit from their ads, whereas parties whose group of close parties is more dispersed experience a negative effect from their ads (see Table OA.21).

In conclusion, the findings reveal that other parties' ads significantly influence a party's vote share and do not always serve as substitutes. Whether these ads have positive or negative effects may depend on ideological distance and the perceived likelihood of post-electoral coalitions. This supports models suggesting that policy-motivated voters take into account potential post-election coalitions when making voting decisions (Austen-Smith and Banks 1988; Baron and Diermeier 2001).

8. Additional Heterogeneity and Robustness Checks

8.1. Additional Heterogeneity Analysis

In a multi-party system, party characteristics are likely to be relevant for voters beyond the left-right divide. I consider the effects across three different party types: left and right, national and regional, and old and new parties. These are added as interaction terms with Ad density to test whether there is any difference in the effectiveness of the ads. As shown in Table A.12, ads from left-wing parties are more effective than those from right-wing parties, while there is no statistically significant difference between national and regional parties.

Ad effectiveness may vary due to ad design. Data collected on ad content and featured candidates show that slogans are brief (average 3.4 words) and generally lack policy or ideological content beyond calls for change.[34] Despite similar information content, non-informational elements can influence voter preferences. Studies indicate that candidates' physical appearance affects perceptions of competence and voting likelihood.[35] The presence of women in ads can affect decisions (e.g. Bertrand et al. 2010), and voters may perceive female candidates as less competent.[36] Ads featuring older candidates may be more effective if voters associate experience with competence.

[34] Examples include: "A lot to defend" (regional center-right, 2016), "Let's win the change" (left, 2016), "Make it happen" (center-left, 2019).
[35] Alexander and Andersen (1993); Ballew and Todorov (2007); Bailenson et al. (2008); Spezio et al. (2008); Berggren et al. (2010); Schubert et al. (2011); Horiuchi et al. (2012); Casey (2022).
[36] Huddy and Terkildsen (1993); Sanbonmatsu (2002); Le Barbanchon and Sauvagnat (2022).

The analysis focuses on visible candidate characteristics that could influence voters: gender, age, and familiarity (e.g. Kam and Zechmeister 2013). These characteristics are included in regressions as interactions with ad density. As shown in Table A.13, all interaction terms are significant at the 1% level. Ads featuring young or female candidates are less effective than those featuring older or male candidates. These findings support models where voters care about candidates' characteristics (e.g. Kartik and McAfee 2007; Krasa and Polborn 2012).

Another possible explanation for why we see such different effects across parties is the area's political alignment. Some parties may have been placed in areas where the voters were already favorable to them or instead where they would be very unresponsive to their ads. I consider the section's previous voting history by looking at the results of the 2011 general election.[37] I then group sections into three categories: if the combined vote share of left-wing parties differed from that of right-wing parties by 10 percentage points, the area is considered to be aligned, if the difference in vote shares is within a 10 percentage point range, the area is considered to be disputed, and otherwise it is considered to be misaligned. These three groups represent 20.5%, 47% and 32.5% of the sections, respectively. From this, three binary variables indicate whether a party is in an aligned area (e.g., left-wing parties in left-leaning areas), a disputed area, or an misaligned area (e.g., left-wing parties in right-leaning areas). As table Table OA.22 shows, the effect of ads is positive and statistically significant in aligned and disputed areas, while it is negative in misaligned areas.

8.2. Robustness Checks

Regarding the average effects of ads, discussed in Section 5, I consider the following robustness checks. The effect of ads on vote share is consistently positive and statistically significant when using different area buffers – from 300 to 450 meters, in 50-meter increments – see Table OA.14. I also consider using raw vote shares[38] as an alternative dependent variable measuring voting behavior. The results, shown in Table OA.16 across different buffers, are consistent with the main results. Additionally, the results also hold when using a different specification and regressing the change in vote share across the two elections against the change in ad density. The effect is

[37] The 2011 election is the earliest general election that can be used without a significant loss of observations due to border changes after the 2011 decennial census. I only focus on general elections to ensure that voting patterns are comparable.

[38] Number of votes for a party divided by the electorate.

always positive and statistically significant for all buffers and when using raw vote shares– see Table A.7 and Table OA.17, respectively.

I also consider dropping the section fixed effects and instead including section-level controls for all the main tables shown in Section 5 to Section 7. I add socio-demographic controls at the section level – such as percentage of the population aged 18 or younger, share of households with an income below 40% of the nationwide median – and district fixed effects, of which there are 10 in Barcelona. All the results for the average effects of ads (Table OA.18), heterogeneous effects across area and population characteristics (Table OA.20), and the effects of other parties' ads (Table OA.19) hold. That is, albeit the coefficients are slightly different in magnitude, the signs and statistical significance remain the same or become more significant.[39]

9. Conclusion

This paper provides a comprehensive analysis of the impact of electoral advertising on voting behavior by leveraging the randomized allocation of street-level ads across political parties in Barcelona during the general elections of 2016 and 2019. This distinctive setup both provides a clear identification and allows us to further our understanding of how advertising affects voters.

First, ads have, on average, a positive and significant effect on vote shares. This effect is robust across different specifications and is consistent between both elections. Information seems to be a key driver of this effect. Notably, ads are relatively less effective in areas with an older, richer population. Conversely, ads are more effective for newer parties. The effectiveness of ads appears to be also driven by their salience, as they are more effective when a party's ads constitute at least two-thirds of the ads in an area.

Second, I find that ads have spillover effects: they affect not only their own vote share but also that of other parties. It is worth emphasizing that these are not ads that in any way target other parties explicitly or implicitly. While one might expect that the presence of any competing party's ads would negatively impact a party's vote share, the reality is more nuanced. I find that this is the case for ads of parties that are ideologically distant, which is measured using the voter's perspective on a two-dimensional policy space. For ideologically similar parties, ads of other parties can instead be beneficial. This could be the case for parties that have emphasized the need to form a stable government with like-minded political parties. These findings suggest that advertising is

[39]The only exception in for the effect of ad density of close parties for right-wing parties, which becomes statistically significant and positive (as opposed to slightly negative but not significant). This is in line with the main results.

permeated by the broader electoral context and how parties frame future government alliances, which are taken into account by voters.

All in all, the results underscore the necessity of accounting for heterogeneous voter responses and the environment in which ads are placed. Future research should continue to explore the interplay between ad content, candidate characteristics, and voter demographics, as well as the broader strategic considerations of multi-party systems. Understanding these dynamics can inform the design of more effective campaign strategies and contribute to the ongoing debate about the regulation of electoral advertising. This is particularly relevant in the context of the rise of new technologies that allow for more targeted and personalized political advertising.

References

Alexander, D. and K. Andersen (1993). Gender as a factor in the attribution of leadership traits. *Political Research Quarterly 46*, 527–545.

Ansolabehere, S. and S. Iyengar (1995). *Going negative: How attack ads shrink and polarize the electorate*. Free Press.

Ashworth, S. and E. Bueno de Mesquita (2014). Is Voter Competence Good for Voters?: Information, Rationality, and Democratic Performance. *American Political Science Review 108*(3), 565–587.

Ashworth, S. and E. B. de Mesquita (2009). Elections with platform and valence competition. *Games and Economic Behavior 67*, 191–216.

Austen-Smith, D. and J. Banks (1988). Elections, coalitions, and legislative outcomes. *American Political Science Review 82*(2), 405–422.

Avis, E., C. Ferraz, F. Finan, and C. Varjão (2022). Money and politics: The effects of campaign spending limits on political entry and competition. *American Economic Journal: Applied Economics 14*, 167–199.

Bahnsen, O., T. Gschwend, and L. F. Stoetzer (2020). How do coalition signals shape voting behavior? revealing the mediating role of coalition expectations. *Electoral Studies 66*, 102166.

Bailenson, J. N., S. Iyengar, N. Yee, and N. A. Collins (2008). Facial Similarity between Voters and Candidates Causes Influence. *Public Opinion Quarterly 72*(5).

Ballew, C. C. I. and A. Todorov (2007). Predicting political elections from rapid and unreflective face judgments. *Proceedings of the National Academy of Sciences of the United States of America 104*, 17948–17953.

Barbanchon, T. L. and J. Sauvagnat (2022). Electoral competition, voter bias, and women in politics. *Journal of the European Economic Association 20*, 352–394.

Baron, D. P. (1994). Electoral competition with informed and uniformed voters. *American Political Science Journal 88*(1), 33–47.

Baron, D. P. and D. Diermeier (2001). Elections, governments, and parliaments in proportional representation systems. *The Quarterly Journal of Economics 116*(3), 933–967.

Barton, J., M. Castillo, and R. Petrie (2016). Negative campaigning, fundraising, and voter turnout: A field experiment. *Journal of Economic Behavior and Organization 121*, 99–113.

Bekkouche, Y., J. Cagé, and E. Dewitte (2022). The heterogeneous price of a vote: Evidence from multiparty systems, 1993–2017. *Journal of Public Economics 206*, 104559.

Berggren, N., H. Jordahl, and P. Poutvaara (2010). The looks of a winner: Beauty and electoral success. *Journal of Public Economics 94*, 8–15.

Bernhardt, D., O. Camara, and F. Squintani (2011). Competence and ideology. *The Review of Economic Studies 78*, 487–522.

Bertrand, M., D. Karlan, S. Mullainathan, E. Shafir, and J. Zinman (2010). What's Advertising Content Worth? Evidence from a Consumer Credit Marketing Field Experiment. *Quarterly Journal of Economics 125*(1), 263–306.

Bidwell, K., K. Casey, and R. Glennerster (2020). Debates: Voting and Expenditure Responses to Political Communication. *Journal of Political Economy 128*, 2880–2924.

Bordalo, P., N. Gennaioli, and A. Shleifer (2013). Salience and consumer choice. *Journal of Political Economy 121*(5), 803–843.

Bordalo, P., N. Gennaioli, and A. Shleifer (2016). Competition for attention. *The Review of Economic Studies 83*(2), 481–513.

Buisseret, P. and C. Prato (2020). Voting behavior under proportional representation. *Journal of Theoretical Politics 32*, 96–111.

Cagé, J. (2020). *The Price of Democracy: How Money Shapes Politics and What To Do About It.* Harvard University Press.

Caprini, G. (2023). Visual Bias. *Economics Series Working Papers, University of Oxford, Department of Economics 106*.

Casas-Arce, P. and A. Saiz (2015). Women and power: Unpopular, unwilling, or held back? *Journal of Political Economy 123*, 641–669.

Casey, K. (2022). Snap judgments: Predicting politician competence from photos. *The Journal of Politics 84*(2), 698–713.

Clinton, J. D. and J. S. Lapinski (2004). "targeted" advertising and voter turnout: An experimental study of the 2000 presidential election. *The Journal of Politics 66*, 69–96.

Conley, T. G. (1999). GMM estimation with cross-sectional dependence. *Journal of Econometrics 92*, 1–45.

Cruz, C., P. Keefer, and J. Labonne (2021). Buying informed voters: New effects of information on voters and candidates. *The Economic Journal 131*, 1105–1134.

Dal Bó, E., F. Finan, O. Folke, T. Persson, and J. Rickne (2017). Who becomes a politician? *The Quarterly Journal of Economics 132*, 1877–1914.

DellaVigna, S. and E. Kaplan (2007, 8). The Fox News Effect: Media Bias and Voting. *The Quarterly Journal of Economics 122*, 1187–1234.

Durante, R. and E. Guitierrez (2014). Political advertising and voting intentions: Evidence from exogenous variation in ads viewership. Working paper.

Fernandez-Vazquez, P. and Z. Somer-Topcu (2019). The informational role of party leader changes on voter perceptions of party positions. *British Journal of Political Science 49*(3), 977–996.

Fouirnaies, A. (2021). How do campaign spending limits affect elections? evidence from the united kingdom 1885-2019. *American Political Science Review 115*, 395–411.

Freedman, P., M. Franz, and K. Goldstein (2004). Campaign advertising and democratic citizenship. *American Journal of Political Science 48*, 723–741.

Galasso, V., T. Nannicini, and S. Nunnari (2023). Positive spillovers from negative campaigning. *American Journal of Political Science 67*, 5–21.

Gerber, A. S., J. G. Gimpel, D. P. Green, and D. R. Shaw (2011). How large and long-lasting are the persuasive effects of televised campaign ads? results from a randomized field experiment. *American Political Science Review 105*, 135–150.

Gossner, O., J. Steiner, and C. Stewart (2021). Attention Please! *Econometrica 89*(4), 1717–1751.

Gottlieb, J. and H. Larreguy (2020). An Informational Theory of Electoral Targeting in Young Clientelistic Democracies: Evidence from Senegal. *Quarterly Journal of Political Science 15*(1), 73–104.

Green, D. P. and A. S. Gerber (2015). *Get out the Vote: How to Increase Voter Turnout* (3rd ed.). Brookings Institution Press.

Green, D. P., J. S. Krasno, A. Coppock, B. D. Farrer, B. Lenoir, and J. N. Zingher (2016). The effects of lawn signs on vote outcomes: Results from four randomized field experiments. *Electoral Studies 41*, 143–150.

Green, D. P., D. Ong, K. Rutherford, and A. Schein (2024). Do Billboard Advertisements Increase Voter Turnout? A Large-Scale Field Experiment. *Quarterly Journal of Political Science 19*(3).

Gschwend, T., M. F. Meffert, and L. F. Stoetzer (2017). Weighting parties and coalitions: How coalition signals influence voting behavior. *The Journal of Politics 79*(2), 642–655.

Horiuchi, Y., T. Komatsu, and F. Nakaya (2012). Should candidates smile to win elections? an application of automated face recognition technology. *Political Psychology 33*, 925–933.

Huber, G. and K. Arceneaux (2007). Identifying the persuasive effects of presidential advertising. *American Journal of Political Science 51*, 957–977.

Huddy, L. and N. Terkildsen (1993). Gender Stereotypes and the Perception of Male and Female Candidates. *American Journal of Political Science 37*(1), 119–147.

Kalla, J. L. and D. E. Broockman (2018). The minimal persuasive effects of campaign contact in general elections: Evidence from 49 field experiments. *American Political Science Review 112*, 148–166.

Kam, C. D. and E. J. Zechmeister (2013). Name Recognition and Candidate Support. *merican Journal of Political Science 57*.

Kartik, N. and R. P. McAfee (2007, 5). Signaling character in electoral competition. *American Economic Review 97*, 852–870.

Kartik, N., M. Ottaviani, and F. Squintani (2007). Credulity, lies, and costly talk. *Journal of Economic Theory 134*, 93–116.

Kendall, C., T. Nannicini, and F. Trebbi (2015). How do voters respond to information? evidence from a randomized campaign. *American Economic Review 105*, 322–353.

Krasa, S. and M. K. Polborn (2012). Political competition between differentiated candidates. *Games and Economic Behavior 76*(1), 249–271.

Krasno, J. S. and D. P. Green (2008). Do Televised Presidential Ads Increase Voter Turnout? Evidence from a Natural Experiment. *The Journal of Politics 70*, 245–261.

Larreguy, H., J. Marshall, and J. M. J. Snyder (2018). Leveling the playing field: How campaign advertising can help non-dominant parties. *Journal of the European Economic Association 16*, 1812–1849.

Lau, R. R. and I. B. Rovner (2009). Negative campaigning. *Annual Review of Political Science 12*, 285–306.

Le Barbanchon, T. and J. Sauvagnat (2022). Electoral Competition, Voter Bias, and Women in Politics. *Journal of the European Economic Association 20*(1).

Le Pennec, C. and V. Pons (2023). How do Campaigns Shape Vote Choice? Multicountry Evidence from 62 Elections and 56 TV Debates. *The Quarterly Journal of Economics 138*, 703–767.

Levy, G., I. M. de Barreda, and R. Razin (2021). Polarized extremes and the confused centre: Campaign targeting of voters with correlation neglect. *Quarterly Journal of Political Science 16*(2), 139–155.

Mullainathan, S., J. Schwartzstein, and A. Shleifer (2008). Coarse Thinking and Persuasion. *The Quarterly Journal of Economics 123*(2), 577–619.

Pons, V. (2018, 6). Will a Five-Minute Discussion Change Your Mind? A Countrywide Experiment on Voter Choice in France. *American Economic Review 108*, 1322–1363.

Sanbonmatsu, K. (2002). Gender Stereotypes and Vote Choice. *American Journal of Political Science 46*(1), 20–34.

Schubert, J. N., M. A. Curran, and C. Strungaru (2011). Physical attractiveness, issue agreement, and assimilation effects in candidate appraisal. *Politics and the Life Sciences 30*, 33–49.

Sides, J., L. Vavreck, and C. Warshaw (2022). The Effect of Television Advertising in United States Elections. *American Political Science Review 116*, 702–718.

Silveira, B. S. D. and J. M. P. D. Mello (2011). Campaign Advertising and Election Outcomes: Quasi-natural Experiment Evidence from Gubernatorial Elections in Brazil. *The Review of Economic Studies 78*, 590–612.

Spenkuch, J. L. and D. Toniatti (2018). Political advertising and election results. *The Quarterly Journal of Economics 133*, 1981–2036.

Spezio, M. L., A. Rangel, R. M. Alvarez, J. P. O'Doherty, K. Mattes, A. Todorov, H. Kim, and R. Adolphs (2008). A neural basis for the effect of candidate appearance on election outcomes. *Social Cognitive and Affective Neuroscience 3*, 344–352.

Tribunal de Cuentas (2017). Informe de fiscalización de las contabilidades de las elecciones a cortes generales de 26 de junio de 2016. Technical report.

Tribunal de Cuentas (2020). Informe de fiscalización de las contabilidades de las elecciones a cortes generales de 28 de abril de 2019. Technical report.

Zaller, J. R. (1992). *The Nature and Origins of Mass Opinion*. Cambridge University Press.

Appendix

A. Empirical Strategy

Selection of Location of Ads

There are a set of reasons why it would be difficult for the townhall to strategically place ads. First, the townhall tends to pick long and wide streets that are busy and crowded. They even take into consideration whether there are any planned works in the street that would make it difficult to place the ads and for the voters to see them. Second, the random allocation of ads to parties is done by the JEZ, which is a separate entity from the townhall, and it is unlikely that they would be only be able to select the streets that would benefit the governing party. Finally, most of the changes in the street segments observed between 2016 and 2019 correspond to selecting different street segments within the same street. Furthermore, I plot the vote share of ECP, the party that governed the townhall from May 2015 onward – this would be the only party with the ability to select which areas were available for political ads in Figure OA.9.[40] In particular, I group census sections by whether they were exposed to ads only in the 2016 elections, only in the 2019 elections, in both elections, or in none of them. I also include the confidence intervals for the first two groups, which are the two groups that changed status in either election. From the graph, it is clear that there is no difference in the voting patterns for ECP and that those differences are not statistically significant.

Do parties modify their campaign strategy based on their allocated lottery spots?

Above all, it should be clear that any evidence that I may provide here is based on reading interviews with campaign organizers and my own conversations with local party organizers in Barcelona. Generally speaking, local party organizers told me they did not change their strategy based on where their ads were located.

First, the allocation of ad space is done within two weeks to ten days of the start of the campaign, which severely limits the party's ability to change their strategies. As explained in the main body of the paper, ad content itself is fairly generic and not strategically placed in a given location.

[40] Only three elections are available for this party, their first run being in December 2015.

Second, the types of campaigning that could be more easily adjusted would be door-to-door campaigning and phone banks, which are a fairly uncommon practice in campaigns in Spain, although they do exist. On the latter, this is mostly limited to having stands on the street where party officials and, very occasionally, candidates, will provide with information and leaflets to passersby. To the best of my knowledge, the decision on the location is based on (i) availability as time and location are also determined by the local authorities and the JEZ, and (ii) areas that are likely to see the most foot traffic. Unfortunately, I was not able to obtain a list of the party-level allocation of campaigning venues from the Barcelona townhall. On phone banks, political parties often target areas with a high unemployment rate or a relatively older population. This is because they are most likely to be at home at any given time of the day and because parties have very specific and tailored policies aimed at these two groups of voters.

On the other hand, parties could choose to leave some spots empty. Given the low costs associated with printing some additional posters and banners, this is unlikely to be the case. My conversations with campaign organizers also confirmed this. Parties could forfeit ad space altogether. If this were the case, it is more likely that such a party would have preferred to not participate in the lottery. However, it is true that in 2016 one party chose to not have any street-level advertising at all: PSC. It was a last-minute decision made by the central party organization (the Spanish Socialist Workers' Party, to which PSC is affiliated to). As this had been the second election in less than a year, this move was seen as a way to appease voter outrage at high campaign expenses following the parties' failure to form a government. This decision was not adopted by any other party.

Finally, voters are not aware of how street-level ads are allocated (or any other types of ads). I have had several conversations with people who live in Barcelona (including academics and people who have always lived there) and I have not met one that knew about this particular allocation method. My conversations with campaign organizers suggests that they also know that the electorate is, in general, unaware of this.

B. Turnout

In this section I consider the effects of ads on turnout. As explained in the main body of the paper, this is a less than ideal context to for this particular question since the number and location of ads is not randomized. That is, which locations will have ads are pre-selected by the townhall but

then which parties are assigned to each location is random. Instead, I use the cross-year variation in areas that were exposed to add to further explore the relationship between ads and turnout.

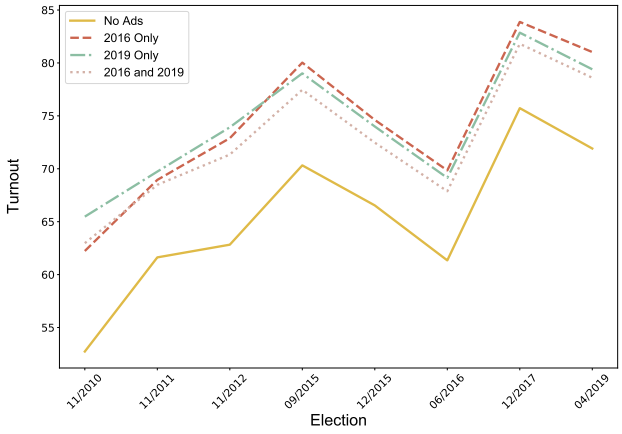


Figure A.4. **Turnout in General and Regional Elections in Barcelona (2010–2019)**

In Figure A.4, I plot the turnout throughout the eight general and regional elections in Barcelona between 2010 and April 2019.[41] I compare four groups of sections: (1) sections that had ads only in 2016, (2) sections that had ads only in 2019, (3) sections that had ads in both years, and (4) the sections that had no ads in either election.

It is clear from the graph that the four groups follow the same trend. It must also be noted that the group of sections without any ads in both years consistently reports a turnout 10 points below the other three groups. To further check any possible differences in the voting trends across groups, I also plot the evolution of the vote shares of the four groups for the four parties that have run in every election from 2010 to 2019.[42] In Figures OA.10, it is also quite apparent that there is a common trend for all four groups for each of the parties' vote shares.

The estimation strategy follows a difference-in-differences approach by comparing group (1) and group (2) to group (3), separately, That is, I estimate the following two equations:

$$\text{Turnout}_{s,t} = \alpha + \gamma \text{Group1}_s + \lambda \text{Year}_{2016} + \delta \text{Group1}_s \times \text{Year}_{2016} + \beta X_{s,t} + \varepsilon_{s,t} \quad (3)$$

$$\text{Turnout}_{s,t} = \alpha + \gamma \text{Group2}_s + \lambda \text{Year}_{2019} + \delta \text{Group2}_s \times \text{Year}_{2019} + \beta X_{s,t} + \varepsilon_{s,t} \quad (4)$$

[41] In particular, I use the 2011, 2015, 2016, and 2019 general elections as well as the 2010, 2012, 2015, and 2017 elections to the Catalan parliament.

[42] CDC was in a coalition with Unió Democràtica de Catalunya until 2015. In the 09/2015 Catalan elections, CDC and ERC formed an electoral coalition and so, for the sake of comparability, I omit this particular year.

where $\text{Turnout}_{s,t}$ is the turnout in section s at election t, Group1_s is a binary variable indicating whether section s saw ads only in the 2016 election, Group2_s is a binary variable indicating whether section s saw ads only in the 2016 election, and $X_{s,t}$ is a vector of control variables including percentage of the population aged 65 or older, average share of household income coming from wages, share of households with an income below 40% of the nationwide median, and the 80:20 ratio. In both equations Group 3, that is the sections that had ads in both years, acts as a control group. Table OA.23 displays the results.

I find that the sign of the coefficients goes in the expected direction – γ from Equation 3 is negative and γ from Equation 4 is positive. This means that turnout decreased in 2019 in areas that were only exposed to ads in 2016 compared to areas that were exposed to ads in both years. Conversely, turnout increased in 2019 in areas that were only exposed to ads in 2019 alone compared to areas that were exposed to ads in both years. However, due to the small number of observations in group 1 and group 2 – 2% and 5%, respectively – the standard errors are very large.

Finally, I consider whether candidate characteristics may affect turnout. Focusing on only sections that saw at least one ad, whether they saw ads of a new candidate or a woman candidate is still subject to randomization – given that parties do not choose their candidates or ads based on location. I find that candidate characteristics also has very small and insignificant effects on turnout – see Table OA.24. These results are consistent with the literature, that also finds little evidence of the effects of political advertising on turnout (e.g. Krasno and Green (2008); Kendall et al. (2015); Freedman et al. (2004); Huber and Arceneaux (2007); Green and Gerber (2015)).

C. Additional Tables and Figures

Table A.6. **Distribution of Street-Level Ads in Barcelona (2016)**

	ECP	PSC	ERC	Cs	CDC	PP	PACMA	Total
Banners (N)	1632	886	850	800	746	734	58	5706
Banners (%)	28.60	15.53	14.90	14.02	13.07	12.90	1.02	
Segments (N)	17	11	9	9	9	7	1	63
Segments (%)	26.99	17.46	14.29	14.29	14.29	11.11	1.59	
Posters (N)	25	15	13	13	12	10	1	89
Posters (%)	28.08	16.85	14.61	14.61	13.48	11.24	1.12	
2015 Votes (%)	27.08	16.37	14.57	13.64	13.33	11.34	1.09	
2016 Votes (%)	25.68	16.25	16.56	11.53	12.26	13.54	1.80	

Notes: The distribution of the electoral campaign space is for the 2016 general election, held in June. The electoral results refer to the previous comparable election, which was held in December 2015. ECP stands for "En Comú Podem" (In Common, We Can), PSC stands for "Partit dels Socialistes de Catalunya" (Party of the Catalan Socialists), ERC stands for "Esquerra Republicana de Catalunya" (Republican Left of Catalonia), Cs stands for "Ciutadans" (Citizens), CDC stands for "Democràcia i Llibertat" (Democracy and Freedom), PP stands for "Partit Popular de Catalunya" (People's Party of Catalonia), and PACMA stands for "Partit Animalista Contra el Maltractament Animal" (Animalist Party Against Mistreatment of Animals). Note that, for this particular election PSC chose not to not have any street-level ads. This was a country-wide decision.

D. Regression Tables

Table A.7. **Effects of the Change in Ad Density on the Change in Vote Shares (2016-2019)**

	Δ Vote Shares				
	300m	350m	400m	450m	500m
Δ Ad Density	0.370^{*}	0.503^{**}	0.658^{***}	0.760^{***}	0.873^{***}
	(0.162)	(0.176)	(0.188)	(0.202)	(0.217)
	[0.217]	[0.237]	[0.253]	[0.272]	[0.293]
Observations	4560	4872	5136	5418	5556
R^2	0.07	0.07	0.07	0.07	0.07
Controls	Yes	Yes	Yes	Yes	Yes
Party×Year FEs	Yes	Yes	Yes	Yes	Yes

Notes: Δ Vote Share refers to the change in vote share for a given party between the 2016 and 2019 elections. Δ Ad density refers to the change in the number of ads in $100m^2$ between the 2016 and 2019 elections. All parties that had ads in both elections are included. All sections that had ads in both elections are included. Controls include the change between the two elections of the following variables: total ad density, average share of household income coming from wages, percentage of the population aged 18 or younger, share of households with an income below 40% of the nationwide median, and the 80:20 ratio. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table A.8. **Effects of Other Parties' Ad Density on Vote Shares (2016–2019)**

	Vote Shares		
	(1)	(2)	(3)
Ad Density Close Parties	-0.073	–	-0.646***
	(0.087)		(0.080)
	[0.104]		[0.093]
	{0.324}		{0.026}
Ad Density Distant Parties	–	-0.708***	-0.986***
		(0.130)	(0.142)
		[0.162]	[0.177]
		{0.259}	{0.174}
Observations	11571	11571	11571
R^2	0.60	0.60	0.61
Section FEs	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes
Party FEs	Yes	Yes	Yes
Party×Year FEs	Yes	Yes	Yes

Notes: Ad density refers to the number of ads of a party p in 100m^2. Ad density Distant parties refers to the number of ads of parties that are over 4 points away from party p using both scales. Only parties with an observed ideology are included – namely, only PACMA and FRONT are excluded. Results shown using the 500m perimeter of influence. Heteroskedasticity-robust standard errors are reported in parentheses. Conley standard errors are reported in squared brackets. Randomization inference p-values are in curly brackets. Significance stars are reported with respect to Conley standard errors. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table A.9. **Effect of Banner and Poster Density on Vote Shares**

	Vote Share								
	2016-2019			2016			2019		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Banner Density	0.963***	–	0.953***	0.769**	–	0.861***	1.196***	–	1.152***
	(0.152)		(0.150)	(0.305)		(0.305)	(0.165)		(0.160)
	[0.189]		[0.187]	[0.359]		[0.361]	[0.200]		[0.192]
	{0.110}		{0.100}	{0.360}		{0.352}	{0.066}		{0.049}
Poster Density	–	16.279	-0.321	–	-8.704	-37.787*	–	29.693**	20.955
		(12.133)	(11.817)		(20.045)	(20.105)		(14.688)	(14.056)
		[13.572]	[13.291]		[21.140]	[21.603]		[16.849]	[16.047]
		{0.322}	{0.665}		{0.477}	{0.420}		{0.224}	{0.190}
R^2	0.74	0.73	0.73	0.65	0.62	0.63	0.79	0.80	0.79
Observations	12762	11265	14472	4824	4290	5670	7938	6975	8802
Section FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Party FEs	–	–	–	Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	–	–	–	No	No	Yes	No	No	Yes
Party×Year FEs	No	No	Yes	–	–	–	–	–	–

Notes: Banner (poster) density refers to the number of banners (posters) in $100m^2$. The sample is restricted to sections that had at least one ad, one poster, or either. Results shown using the 500m perimeter of influence. Standard errors are clustered at the section level and are reported in parentheses. Conley standard errors are reported in squared brackets. Randomization inference p-values are in curly brackets. Significance stars are reported with respect to Conley standard errors. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table A.10. **Ad Density and Area Characteristics (2016–2019)**

	Vote Share		
Ad Density	0.751***	0.871***	0.810***
	(0.160)	(0.164)	(0.147)
	[0.200]	[0.208]	[0.183]
	{0.147}	{0.108}	{0.145}
Ad Density × Low Shop Density	0.288	0.364	–
	(0.344)	(0.345)	
	[0.376]	[0.364]	
	{0.429}	{0.378}	
Ad Density × High Pollution	0.872*	–	0.905*
	(0.453)	(0.451)	
	[0.530]	[0.513]	
	{0.334}	{0.325}	
R^2	0.73	0.73	0.73
Observations	14472	14472	14472
Section FEs	Yes	Yes	Yes
Party×Year FEs	Yes	Yes	Yes

Notes: Ad density refers to the number of ads per $100m^2$ of party p in section i. Ad density × Above Median Income refers to the interaction between Ad Density and a binary variable indicating whether the section is above or below the median income of treated section. Ad density × Above Median Age refers to the interaction between Ad Density and a binary variable indicating whether the section is above or below the median average household age of treated section. Heteroskedasticity-robust standard errors are shown in parentheses and Conley standard errors are reported in brackets. Randomization inference p-values are in curly brackets. Significance stars are reported with respect to Conley standard errors. Results shown using the 500m perimeter of influence. ***: $p < 0.01$, **: $p < 0.05$,*: $p < 0.10$.

Table A.11. **Ad Concentration and Vote Shares (2016–2019)**

	Vote Share		
	2016-2019	2016	2019
Ad Share	3.593***	0.870	1.329**
	(0.770)	(0.969)	(0.667)
	[0.811]	[0.946]	[0.693]
	{0.008}	{0.320}	{0.182}
R^2	0.76	0.66	0.78
Observations	885	852	1053
Section FEs	Yes	Yes	Yes
Party FEs	Yes	Yes	Yes
Year FEs	Yes	No	No
Party×Year FEs	Yes	No	No

Notes: Ad Share refers to the share of ads of a party in a given section. The sample for this regression includes sections that saw ads of only one party. Results shown using the 500m perimeter of influence. Standard errors are clustered at the section level and are reported in parentheses. Conley standard errors are reported in squared brackets. Randomization inference p-values are in curly brackets. Significance stars are reported with respect to Conley standard errors. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table A.12. **Ad Density and Party Characteristics (2016–2019)**

	Vote Share		
	(1)	(2)	(3)
Ad Density	0.550*	3.949***	3.222***
	(0.237)	(0.272)	(0.288)
	[0.291]	[0.350]	[0.359]
	{0.214}	{0.247}	{0.035}
Ad Density × Left Parties	1.409***	–	–
	(0.326)		
	[0.400]		
	{0.395}		
Ad Density × Regional Parties	–	-0.380	–
		(0.429)	
		[0.551]	
		{0.880}	
Ad Density × New Parties	–	–	1.806***
			(0.365)
			[0.457]
			{0.699}
R^2	0.47	0.11	0.14
Observations	11571	11571	11571
Section FEs	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes

Notes: Ad density refers to the number of ads of a party p in $100m^2$. Left wing parties are: ECP, ERC, and PSC. Right wing parties are: CDC, Cs, PP, and VOX. Regional parties are: CDC and ERC. National parties are: Cs, ECP, PP, PSC, VOX. New parties are: Cs, ECP, VOX. Old parties are: CDC, ERC, PP, PSC. A party-type binary variable and party-type×year variable are included in the regression, dropping party and party×year fixed effects. Results shown using the 500m perimeter of influence. Heteroskedasticity-robust standard errors are reported in parentheses. Conley standard errors are reported in squared brackets. Significance stars are reported with respect to Conley standard errors. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table A.13. **Ad Density and Candidate Characteristics (2016-2019)**

	Vote Share			
	(1)	(2)	(3)	(4)
Ad Density	1.112***	0.370	1.332***	0.643**
	(0.170)	(0.217)	(0.180)	(0.223)
	[0.204]	[0.257]	[0.217]	[0.267]
	{0.040}	{0.265}	{0.667}	{0.187}
Ad Density × Young Candidate	-0.306	–	–	-1.054***
	(0.220)			(0.298)
	[0.267]			[0.351]
	{0.163}			{0.089}
Ad Density × New Candidate	–	1.092***	–	1.893***
		(0.285)		(0.355)
		[0.348]		[0.425]
		{0.353}		{0.173}
Ad Density × Woman Candidate	–	–	-1.811***	-1.760***
			(0.306)	(0.337)
			[0.355]	[0.384]
			{0.000}	{0.177}
R-Squared	0.61	0.61	0.61	0.61
Observations	11571	11571	11571	11571
Section FEs	Yes	Yes	Yes	Yes
Party×Year FEs	Yes	Yes	Yes	Yes

Notes: Ad density refers to the number of ads of a party p in 100m^2. I include the main parties with ads for which I have data on candidate characteristics: CDC, Cs, ECP, ERC, PP, PSC, and VOX. Young Candidate refers to candidates that are less than 45 years old. New Candidate refers to candidates that have been in politics for four years or less. Results shown using the 500m perimeter of influence. Heteroskedasticity-robust standard errors are reported in parentheses. Conley standard errors are reported in squared brackets. Randomization inference p-values are in curly brackets. Significance stars are reported with respect to Conley standard errors. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Online Appendix

A. Electoral System and Advertising in Spain

Electoral System

The main features of the Spanish electoral system are proportional representation, closed lists, and multiple electoral districts. Parties can choose to run in any given district with a list of candidates. In order to be considered for the allocation of Members of Parliament (MPs) in a given district, parties must obtain at least 3% of the votes in that district. Seats are subsequently allocated following the D'Hondt method. Spain's legislature is constituted of two separate chambers: the parliament and the senate. Elections are held every four years for the lower and upper chambers, but parties' campaigning efforts focus on candidates running for parliament.

All elections are overseen by the Junta Electoral, the electoral commission. Any possible transgressions of electoral laws are dealt with by this commission, which usually delegates its power to the regional or local electoral commissions. The local commissions are formed by three judges and two independents that have a degree in Law, Political Science, or Sociology that live in that judicial district.[43] The members of the local commission remain anonymous. The local commissions are formed a couple of months before election day and dismissed one hundred days afterward.[44]

Electoral Advertising and its Regulation

Spanish electoral law regulates all forms of traditional electoral advertising. On television and radio, state-owned channels offer a set amount of free airtime, with the duration and timing allocated based on each party's performance in the previous election. The total amount of time allocated ranges between 10 and 45 minutes. Parties are only eligible to get those spaces if they run in at least 75% of the electoral districts covered by that particular TV channel.[45] These advertising slots are provided at no cost to the parties, and it is not possible to acquire additional

[43] Judicial districts most often correspond to one municipality. Usually, a Junta Electoral de Zona encompasses a territory that is larger than a municipality but smaller than a province.

[44] Ley Orgánica 5/1985, de 19 de junio, del Régimen Electoral General. Tít. I, Cap III.

[45] That is, if that TV channel is only available in one region then parties need only to run in at least 75% if the districts within that region to be eligible to place ads in that channel. Some other conditions apply which can be found in the Ley Orgánica 5/1985, de 19 de Junio, del régimen electoral general, Capítulo VI, Art. 64.4.

slots. Privately-owned media may give parties more freedom in terms of the timing of the ads, although the allocation of airtime is still contingent upon their past electoral performance.

When it comes to mail, parties are able to secure a substantial discount if they choose to send a letter to an entire province (i.e. electoral district), instead of smaller areas. Moreover, parties can only send one letter per voter. Finally, no polls can be published in the week leading to election day.

The banners and posters in the data encompass most, though not the entirety, of street-level advertising. First, the townhall also puts up some panels across the city where any party – irrespective of whether it requested space for banners and posters – is allowed to display ads. These are often put on the ground, reclining on a wall, where parties can put ads one on top of the others, ads can be torn, painted over, etc. Second, parties may also put electoral ads in designated areas where anyone is free to put up whatever poster or piece of paper they which. Hence, not only can other parties put up their posters on top of another party's but so can private firms and individuals and also be subject to being torn, taken down, hidden, etc. Finally, ad space can be purchased to be displayed in subway and bus stations. I could not find any legal documents explaining whether these spaces follow any proportionality rules. After contacting local campaign organizers in Barcelona, it seems that the purchase or location of these ads, or other campaign-related activities, is not contingent on the lottery allocation.

Campaign Spending

The amount a party can spend for a given general election is capped at €0.37 per voter within a given electoral district.[46] Only very small parties, which run in few or small electoral districts, go over the spending limit; major parties tend to spend a substantially lower amount.[47]

All parties that obtain at least one MP or senator on that particular election are entitled to a government subsidy of their campaign. The precise subsidy amount is contingent upon several factors, including the total number of MPs elected, the quantity of votes garnered for their parliamentary lists, and the count of votes cast for their Senate candidates. To cover the remaining expenses, parties typically depend on party funds, private donations, and bank credits. Lastly,

[46] Ley Orgánica 5/1985, de 19 de junio, del Régimen Electoral General. Tít. I, Cap VI.

[47] This was indeed the case in the 2016 general elections, as seen in the reports submitted to the Tribunal de Cuentas (Court of Auditors) available in the "Informe de Fiscalización de las Contabilidades de las Elecciones a Cortes Generales de 26 de Junio de 2016."

the maximum donation limit for any individual or legal entity to a party, federation, or coalition is set at €10,000 per election.

In Spain, the actions of the incumbent party are subject to strict regulations. Once elections are announced, the government cannot conduct any events or institutional campaigns that highlight the achievements of the government or use imagery and language reminiscent of their campaign slogans. Additionally, government officials are barred from taking part in the inauguration of public works or the commencement of public projects during this period.

Census Sections and Elections

Census sections are determined by the population registered in the Decennial Census. When individuals relocate, whether within the same city or to a different location, they typically inform the local townhall of their change of residence or officially register as residents in the new area. The primary concern for our analysis arises when individuals are registered as residents in a specific census section but, in reality, live elsewhere within the city. This is unlikely to be the case for a significant proportion of the population since crucial elements of public services are determined by the area of residence of a person. For instance, for medical appointments a person will be directed to the closest hospital or healthcare center as given by their registered residence.

The votes recorded within a census section correspond to voters who either voted in person or that requested an absentee ballot. They do not include the votes of voters who are registered as living abroad. If a person living abroad decided not to register at the consulate, she would only able to vote in person in Spain, in her designated voting booth. Hence, the share of the population that might not have been present during the electoral campaign and whose vote is recorded in the data should be quite small.

B. Data

Location of Banners and Posters

In the case of the posters, their location is given by the intersection of two streets or a square, which facilitates imputing a set of coordinates. In the case of banners, I use information with respect to the location of the segments, that is the street where they are placed as well as the intersection with the streets that determine the beginning and end of the segment. Furthermore, I also have the total number of banners for each segment, but not the particular location of each

banner. In order to place the banners, I assume that, within a given segment, banners are set such that they are equidistant to each other. This means that since segments vary in length and number of banners they contain, the space between the banners is not the same throughout the city. In the allocation data, streets are divided by segments that are assigned to different parties. Each segment is bounded by the intersections with two other streets or squares. Each segment also has the number of ads in it.

Other Datasets

The INE Atlas de la Renta includes several income-related variables. In particular, yearly average household and per capita income as well as indicators of the sources of income (average share of income coming from wages, pensions, unemployment subsidies, other subsidies, and other income sources). It also has absolute and relative indicators of the income distribution of the households within a given census section, as the 80:20 ratio. In terms of demographic indicators, there are demographic indicators such as population, share of Spanish citizens, average age, percentage of the population below 18 and above 65, average size of the household, and the percentage of uni-personal households.

The geocoded data on the location of ground-level shops and air quality in Barcelona was obtained directly from the townhall's open data portal. For the former, the data is available for the years 2016 and 2019 among others. The dataset includes variables indicating whether the shops are active or not and several categorical variables indicating the type of shop. I exclude any shops that are not listed as active in the year of the election. I include shops from the following activity groups: clothes shops, food and drink shops, shoe shops, perfume and makeup shops, jewelry and watches, bookshops, bakeries, hairdressers, pharmacies, household goods, hospitals and primary health centers, education centers, among others. The air quality data starts in 2018, which is the year that I use in my analysis.

I used the Digital Archives at the Universitat Autònoma de Barcelona, which collects the posters and banners used by the main political parties in Catalonia. Out of the sample of 26 designs, 54% feature the name of the candidate at the national or district level, 61.5% featured a picture of the candidate. 65% of them featured the party's official election slogan together with "vote [party name]." On average, slogans have 3.5 words, with a minimum of 1 and a maximum of 6.

C. Randomization Inference

First, using the number of slots allocated to each party, I simulate 10000 alternative outcomes of the lottery. Then, using a dataset that matches each ad slot – banners and posters separately – to a section, I compute the number of ads per party, section, and election given by the alternative lottery outcome. That is, the dataset shows that poster p was within the buffer of section i in election e. Similarly, b banners within street segment s were within the buffer of section i in election e. The resulting permutation dataset contains the number of ads per party, section, and election given by the alternative lottery outcome.

I then estimate the same model as in the original table using the ads per party, section, and election given by the alternative lottery outcome and retrieve the t-statistic of the coefficients of interest for all permutations. The exact p-value for one-sided tests is computed as follows:

$$p^{\text{RI}} = \begin{cases} 1 - \frac{rk}{|T|} \text{ if } \hat{\tau} \geq 0 \\ \frac{rk}{|T|} \end{cases} \qquad \text{where } rk = \mathbb{1}\{\tilde{\tau} < \hat{\tau} | \text{for } \tilde{\tau} \in T\}$$

where $\hat{\tau}$ is the t-statistic of the coefficient of interest using the actual lottery outcome, $\tilde{\tau}$ is a t-statistic arising from a given alternative lottery outcome, and T is the set of t-statistics from all alternative lottery outcomes.

D. Additional Figures

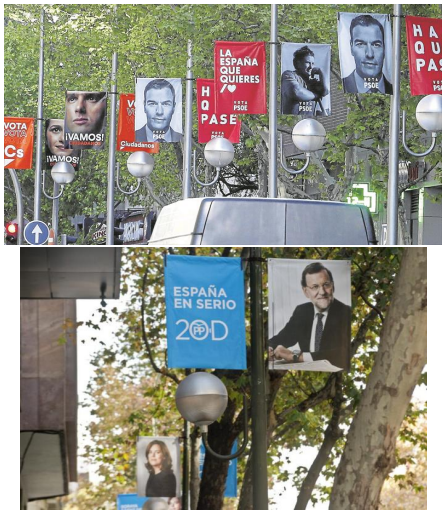


Figure OA.5. **Two Examples of Street-Level Banner Ads in Spain**
Source:*Diario16+* (October 3rd, 2019) and *El Mundo* (May 5th, 2016)

Figure OA.6. **Example of poster ads from the 2004 elections.**
Notes: This picture is taken from "Carteles de la Espaã Democrática" (El País (2024/11/02)). Note that in the context of Barcelona, we would not have two posters of different parties side by side.

(a) **Convergència Democràtica de Catalunya(CDC)**

(b) **Ciutadans (Cs)**

(c) **En Comú Podem (ECP)**

(d) **Partit dels Socialistes de Catalunya (PSC)**

(e) **Esquerra Republicana de Catalunya (ERC)**

(f) **Partido Popular (PP)**

Figure OA.7. **Examples of Banners for the 2019 General Elections**

Source: Dipòsit Digital de Documents de l'Universitat Autònoma de Barcelona.

Figure OA.8. **Example of buffers in Barcelona**

Notes: The area shaded in red represents the census section. The red dotted lines represent the different bufers – from 300m to 500m. Lines represent street segments with banners and dots represent posters. Each party has a color. CDC: Dark blue; Cs: Orange; ECP: Purple; ERC: Yellow; PSC: Red; PP: Light blue.

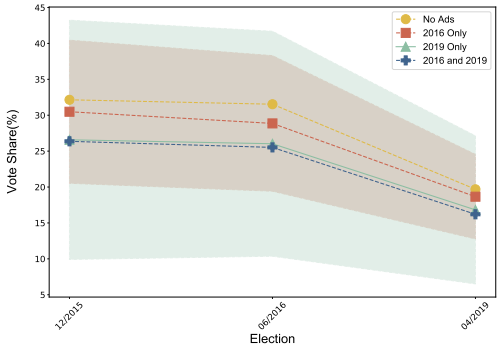
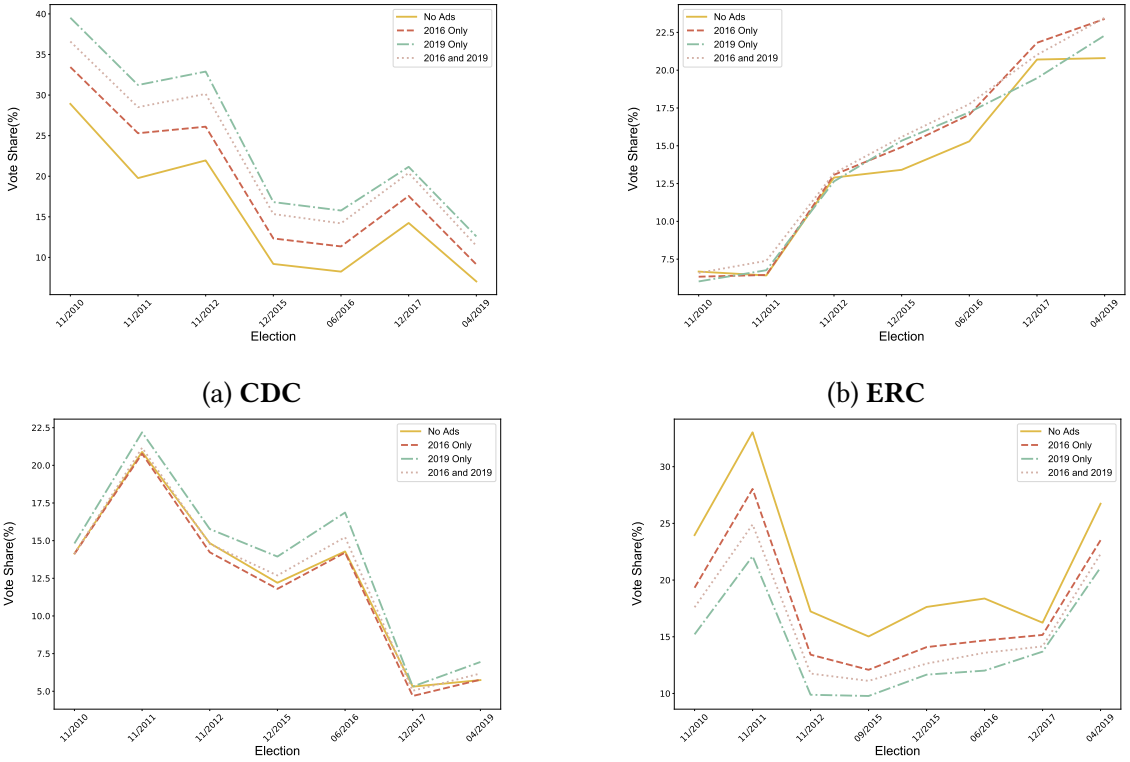


Figure OA.9. **Vote Share of ECP (2015–2019)**



(a) **CDC** (b) **ERC**

(c) **PP** (d) **PSC**

Figure OA.10. **Vote Shares in National and Regional Elections (2010–2019)**

E. Additional Tables

Table OA.14. **Effects of Own Ad Density on Vote Shares by Buffers (2016–2019)**

	Vote Shares				
	300m	350m	400m	450m	500m
	(1)	(2)	(3)	(4)	(5)
Ad Density	0.560***	0.648***	0.742***	0.865***	0.952***
	(0.104)	(0.114)	(0.126)	(0.139)	(0.150)
	[0.130]	[0.143]	[0.158]	[0.173]	[0.187]
Observations	12579	13188	13710	14253	14472
R^2	0.73	0.73	0.73	0.73	0.73
Section FEs	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes
Party FEs	Yes	Yes	Yes	Yes	Yes
Party×Year FEs	Yes	Yes	Yes	Yes	Yes

Notes: Ad density refers to the number of ads in $100m^2$. All parties that had parties in a given election are included. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table OA.15. **Effects of Ads on Vote Shares**

	Vote Share		
	2016	2019	2016-2019
	(1)	(2)	(3)
Ads	0.007**	0.009***	0.007***
	(0.003)	(0.001)	(0.001)
	[0.003]	[0.001]	[0.001]
Observations	5670	8802	14472
R^2	0.63	0.79	0.73
Section FEs	Yes	Yes	Yes
Year FEs	No	No	Yes
Party FEs	Yes	Yes	Yes
Party×Year FEs	No	No	Yes

Notes: Ads refer to the number of ads within a section and its buffer. There are section and party fixed effects. The total area (section and bufffer) is also added as a control. Results shown using the 500m perimeter of influence. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table OA.16. **Effects of Own Ad Density on Raw Vote Shares (2016-2019)**

	Raw Vote Share				
	300m	350m	400m	450m	500m
	(1)	(2)	(3)	(4)	(5)
Ad Density	0.425***	0.496***	0.572***	0.671***	0.748***
	(0.078)	(0.085)	(0.094)	(0.103)	(0.111)
	[0.098]	[0.107]	[0.117]	[0.127]	[0.137]
Observations	12579	13188	13710	14253	14472
R^2	0.74	0.74	0.73	0.73	0.73
Section FEs	Yes	Yes	Yes	Yes	Yes
Party FEs	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes
Party×Year FEs	Yes	Yes	Yes	Yes	Yes

Notes: Raw Vote Share is the number of votes for a given party divided by the number of people registered to vote multiplied by 100. Ad density refers to the number of ads in $100m^2$. All parties that had parties in a given election are included. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table OA.17. **Effects of the Change in Ad Density on the Change in Raw Vote Shares**

	Δ Vote Shares				
	300m	350m	400m	450m	500m
	(1)	(2)	(3)	(4)	(5)
Δ Ad Density	0.320**	0.420**	0.534***	0.623***	0.720***
	(0.116)	(0.127)	(0.134)	(0.144)	(0.155)
	[0.153]	[0.170]	[0.180]	[0.193]	[0.208]
Observations	4560	4872	5136	5406	5556
R^2	0.01	0.01	0.01	0.01	0.01
Controls	Yes	Yes	Yes	Yes	Yes
Party×Year FEs	Yes	Yes	Yes	Yes	Yes

Notes: Δ Vote Share refers to the change in vote share for a given party between the 2016 and 2019 elections. Δ Ad density refers to the change in the number of ads in $100m^2$ between the 2016 and 2019 elections. All parties that had ads in both elections are included. All sections that had ads in both elections are included. Controls include the change between the two elections of the following variables: total ad density, average share of household income coming from wages, percentage of the population aged 18 or younger, share of households with an income below 40% of the nationwide median, and the 80:20 ratio. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table OA.18. **Effects of Own and Other Party's Ad Density on Vote Shares (controls only)**

	Vote Share		
	2016	2019	2016-2019
	(1)	(2)	(3)
Ad Density	0.843***	1.158***	1.036***
	(0.278)	(0.152)	(0.150)
	[0.360]	[0.193]	[0.194]
Observations	5670	8802	14472
R^2	0.62	0.79	0.72
Controls	Yes	Yes	Yes
Year FEs	No	No	Yes
Party FEs	Yes	Yes	Yes
Party×Year FEs	No	No	Yes

Notes: Ad density refers to the number of ads in $100m^2$. There are section and party fixed effects, and column (3) has year and party-year fixed effects. Results shown using the 500m perimeter of influence. All parties that had ads in both elections are included. All sections that had ads in both elections are included. Controls include the following variables: total ad density, average share of household income coming from wages, percentage of the population aged 18 or younger, share of households with an income below 40% of the nationwide median, and the 80:20 ratio. District fixed effects are also included. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table OA.19. **Effects of Other Parties' Ad Density on Vote Shares (controls only)**

	Vote Share					
	Left-Wing Parties			Right-Wing Parties		
	(1)	(2)	(3)	(4)	(5)	(6)
Ad Density Close Parties	-0.809***	–	-1.355***	0.391**	–	0.718***
	(0.134)		(0.187)	(0.128)		(0.149)
	[0.164]		[0.236]	[0.166]		[0.186]
Ad Density Distant Parties	–	-0.256	-1.036***	–	-0.061	0.389
		(0.150)	(0.204)		(0.151)	(0.196)
		[0.189]	[0.263]		[0.198]	[0.255]
Observations	4824	4824	4824	6747	6747	6747
R^2	0.46	0.46	0.46	0.61	0.61	0.61
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Party FEs	Yes	Yes	Yes	Yes	Yes	Yes
Party×Year FEs	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Ad density refers to the number of ads of a party p in $100m^2$. Ad density Close Parties refers to the number of ads of parties that are no more than 4 points away from party p using both scales. Left-wing parties are ECP, ERC, and PSC. Right-wing parties are CDC, Cs, PP, and VOX. Results shown using the 500m perimeter of influence. All parties that had ads in both elections are included. All sections that had ads in both elections are included. Controls include the following variables: total ad density, average share of household income coming from wages, percentage of the population aged 18 or younger, share of households with an income below 40% of the nationwide median, and the 80:20 ratio. District fixed effects are also included. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table OA.20. **Effects of Other Parties' Ad Density on Vote Shares (controls only)**

	Vote Share					
	(1)	(2)	(3)	(4)	(5)	(6)
Ad Density	2.153***	1.691***	1.548***	0.908***	1.010***	0.919***
	(0.257)	(0.235)	(0.180)	(0.153)	(0.158)	(0.145)
	[0.290]	[0.265]	[0.226]	[0.201]	[0.209]	[0.188]
Ad Density × Above Median Income	-1.190***	–	-1.222***	–	–	–
	(0.211)		(0.211)			
	[0.239]		[0.244]			
Ad Density × Above Median Age	-0.889***	-0.939***	–	–	–	–
	(0.235)	(0.236)				
	[0.243]	[0.243]				
Ad Density × Low Density	–	–	–	0.052	0.116	–
				(0.266)	(0.267)	
				[0.301]	[0.301]	
Ad Density × High Pollution	–	–	–	0.744*	–	0.750*
				(0.370)		(0.370)
				[0.438]		[0.435]
R^2	0.73	0.72	0.73	0.73	0.72	0.72
Observations	14472	14472	14472	14472	14472	14472
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Party FEs	Yes	Yes	Yes	Yes	Yes	Yes
Party×Year FEs	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Ad density refers to the number of ads per $100m^2$ of party p in section i. Ad density × Above Median Income refers to the interaction between Ad Density and a binary variable indicating whether the section is above or below the median income of treated section. Ad density × Above Median Age refers to the interaction between Ad Density and a binary variable indicating whether the section is above or below the median average household age of treated section. Ad Density × Low Density refers to the interaction between Ad Density and a binary variable indicating whether the section has a shop density below the 20th percentile of the city's distribution. Ad Density × High Pollution refers to the interaction between Ad Density and a binary variable indicating whether the section has a maximum emission of nitrogen dioxide (NO_2) above 65 $\mu g/m^3$. All parties that had ads in both elections are included. All sections that had ads in both elections are included. Controls include the following variables: total ad density, average share of household income coming from wages, percentage of the population aged 18 or younger, share of households with an income below 40% of the nationwide median, and the 80:20 ratio. District fixed effects are also included. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table OA.21. **Effects of Own and Other Party's Ad Density on Vote Shares (2016–2019)**

	Vote Share					
	Avg. Distance to Close Parties					
	Low			High		
	(1)	(2)	(3)	(4)	(5)	(6)
Ad Density Close Parties	-0.575***	–	-1.276***	0.705***	–	0.583***
	(0.100)		(0.122)	(0.100)		(0.104)
	[0.114]		[0.140]	[0.104]		[0.108]
Ad Density Distant Parties	–	-0.995***	-1.562***	–	-0.452***	-0.326***
		(0.171)	(0.198)		(0.091)	(0.091)
		[0.211]	[0.242]		[0.095]	[0.094]
Observations	6747	6747	4824	4824	4824	
R^2	0.48	0.48	0.49	0.87	0.87	0.87
Section FEs	Yes	Yes	Yes	Yes	Yes	Yes
Party×Year FEs	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Ad density refers to the number of ads of a party p in 100m^2. Ad Density Close Parties refers to the number of ads of parties that are no more than 4 points away from party p using both scales. Parties with low average distance to close parties are those have an average distance below 3 points to close parties; high average distance is defined analogously. Results shown using the 500m perimeter of influence. Heteroskedasticity-robust standard errors are reported in parentheses. Conley standard errors are reported in squared brackets. Significance stars are reported with respect to Conley standard errors. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table OA.22. **Effect of Ads on Vote Shares by Political Alignment**

	2016–2019		2016		2019	
	(1)	(2)	(3)	(4)	(5)	(6)
Ad Density	1.088***	–	0.930***	–	1.201***	–
	(0.154)		(0.289)		(0.155)	
	[0.172]		[0.374]		[0.197]	
Ad Density × Aligned Section	–	4.002***	–	5.195***	–	3.516***
		(0.454)		(0.790)		(0.406)
		[0.542]		[0.916]		[0.493]
Ad Density × Disputed Section	–	1.238***	–	1.080***	–	1.310***
		(0.156)		(0.283)		(0.168)
		[0.170]		[0.352]		[0.211]
Ad Density × Misaligned Section	–	-3.545***	–	-4.009***	–	-3.161***
		(0.462)		(0.591)		(0.557)
		[0.483]		[0.619]		[0.593]
Observations	12778	12778	5106	5106	7672	7672
R^2	0.68	0.69	0.54	0.55	0.76	0.76
Year FEs	–	–	No	No	No	No
Party FEs	–	–	Yes	Yes	Yes	Yes
Party-Year FEs	Yes	Yes	–	–	–	–
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Ad density refers to the number of ads of a party p in 100m^2. Only parties with a known left or right-wing ideology are included. Results shown using the 500m perimeter of influence. A section is a favorable section if the difference in vote share between that party's ideological group (left or right) vote share in 2011 and the vote share of the other group is larger than 10 percentage points. A section is disputed if that difference less than 10 percentage point and unfavorable if the vote difference favors the other group by over 10 percentag points. Controls include the following variables: total ad density, average share of household income coming from wages, percentage of the population aged 18 or younger, share of households with an income below 40% of the nationwide median, and the 80:20 ratio. District fixed effects are also included. Heteroskedasticity-robust standard errors are reported in parentheses. Conley standard errors are reported in squared brackets. Randomization inference p-values are in curly brackets. Significance stars are reported with respect to Conley standard errors. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table OA.23. **Ad Exposure and Turnout**

	Turnout	
	Group 1 vs. Group 3	Goup 2 vs. Group 3
Group1 × Year_{2016}	-0.410	–
	(0.516)	
	[0.540]	
Group2 × Year_{2019}	–	0.607
		(0.476)
		[0.480]
Observations	1890	1956
R^2	0.81	0.81
Mean Outcome	67.91	7.91
Controls	Yes	Yes

Notes: Group1 is a binary variable indicating whether a given section saw ads only in the 2016 election, Group2 is a binary variable indicating whether a given section ads only in the 2016 election. Group 3 refers to the sections that saw ads in both elections and acts as the control group. Controls include the following variables: total ad density, average share of household income coming from wages, percentage of the population aged 18 or younger, share of households with an income below 40% of the nationwide median, and the 80:20 ratio. District fixed effects are also included. Mean Outcome is the average turn out in control sections in 2016. Heteroskedasticity-robust standard errors are shown in parentheses and Conley standard errors are reported in brackets. Significance stars are reported with respect to Conley standard errors. Results shown using the 500m perimeter of influence.

Table OA.24. **Ad Characteristics and Turnout (2016-2019)**

	Turnout			
	(1)	(2)	(3)	(4)
Ad Density	0.032	0.041	0.037	0.030
	(0.047)	(0.057)	(0.044)	(0.059)
	[0.033]	[0.053]	[0.031]	[0.054]
Ad Density × Young Candidate	0.052	–	–	0.045
	(0.076)			(0.094)
	[0.071]			[0.091]
Ad Density × New Candidate	–	0.021	–	-0.012
		(0.075)		(0.089)
		[0.081]		[0.097]
Ad Density × Woman Candidate	–	–	0.083	0.068
			(0.090)	(0.095)
			[0.082]	[0.089]
R-Squared	0.98	0.98	0.98	0.98
Observations	11571	11571	11571	11571
Section FEs	Yes	Yes	Yes	Yes
Party FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
Party×Year FEs	Yes	Yes	Yes	Yes

Notes: Ad density refers to the number of ads of a party p in $100m^2$. I include the main parties with ads for which I have data on candidate characteristics: CDC, Cs, ECP, ERC, PP, PSC, and VOX. Young Candidate refers to candidates that are less than 45 years old. New Candidate refers to candidates that have been in politics for four years or less. Results shown using the 500m perimeter of influence. Heteroskedasticity-robust standard errors are reported in parentheses. Conley standard errors are reported in squared brackets. Significance stars are reported with respect to Conley standard errors. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table OA.25. **Balance Table – Two Most Voted Parties (2016), 500m Buffer, Part 1**

	Most Voted Party	2nd Most Voted Party	Difference	t-statistic
Avg. % Income – Wage (2015)	58.84	59.14	-0.30	-0.92
	(5.70)	(5.34)		{0.28}
Avg. % Income – Wage (2016)	59.42	59.64	-0.22	-0.69
	(5.57)	(5.46)		{0.33}
Avg. % Income – Unemployment Benefits (2015)	1.70	1.61	0.09**	2.19
	(0.78)	(0.69)		{0.26}
Avg. % Income – Unemployment Benefits (2016)	1.43	1.35	0.08**	2.18
	(0.68)	(0.60)		{0.26}
Avg. Household Income (2015)	37415.43	38189.42	-773.99	-1.19
	(11421.64)	(10802.27)		{0.34}
Avg. Household Income (2016)	38176.31	38936.61	-760.30	-1.13
	(11806.77)	(11084.45)		{0.35}
% Households Income<40% Median (2015)	8.24	8.06	0.18	0.80
	(4.00)	(3.53)		{0.44}
% Households Income<40% Median (2016)	8.06	7.92	0.14	0.68
	(3.82)	(3.33)		{0.46}
% Households Income>160% Median (2015)	41.23	43.17	-1.95**	-2.38
	(14.86)	(13.15)		{0.24}
% Households Income>160% Median (2016)	42.47	44.41	-1.94**	-2.35
	(15.02)	(13.24)		{0.24}

Notes: In 2016, the most voted party was ECP (En Comú Podem), followed by PSC (Partit dels Socialistes de Catalunya), which chose not to use the slots assigned. Therefore, I use the third most-voted party this year, ERC (Esquerra Republicana de Catalunya). All variables are from 2015, before any of the two elections. Average % Income from Wage refers to the combined household income that comes from work wages and not other sources of income – e.g. unemployment subsidies. % Households Income<40% Median refers to the share of households whose annual combined income is below 40% on the national median income. Randomization-inference p-values are in curly brackets. Standard errors are in parentheses. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table OA.26. **Balance Table – Two Most Voted Parties (2016), 500m Buffer, Part 2**

	Most Voted Party	2nd Most Voted Party	Difference	t-statistic
80:20 Ratio (2015)	3.03	3.07	-0.04	-1.65
	(0.48)	(0.41)		{0.22}
80:20 Ratio (2016)	3.03	3.08	-0.05*	-1.81
	(0.51)	(0.45)		{0.19}
% Pop > 64 (2015)	22.22	21.97	0.26	0.90
	(4.88)	(4.34)		{0.27}
% Pop > 64 (2016)	22.27	22.09	0.18	0.65
	(4.88)	(4.47)		{0.31}
% Pop < 18 (2015)	14.65	14.34	0.31*	1.90
	(2.83)	(2.68)		{0.22}
% Pop < 18 (2016)	14.83	14.47	0.35**	2.18
	(2.84)	(2.70)		{0.18}
Average Age (2015)	44.41	44.44	-0.03	-0.21
	(2.51)	(2.22)		{0.51}
Average Age (2016)	44.46	44.52	-0.06	-0.41
	(2.51)	(2.24)		{0.46}

Notes: In 2016, the most voted party was ECP (En Comú Podem), followed by PSC (Partit dels Socialistes de Catalunya), which chose not to use the slots assigned. Therefore, I use the third most-voted party this year, ERC (Esquerra Republicana de Catalunya). All variables are from 2015, before any of the two elections. Average Age is the average age of the household. Randomization-inference p-values are in curly brackets. Standard errors are in parentheses. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table OA.27. **Balance Table – Two Most Voted Parties (2016), 500m Buffer, Part 3**

	Most Voted Party	2nd Most Voted Party	Difference	t-statistic
Average Household Size (2015)	2.39	2.38	0.01	1.52
	(0.18)	(0.16)		{0.26}
Average Household Size (2016)	2.37	2.36	0.01*	1.81
	(0.18)	(0.17)		{0.21}
Population (2015)	1487.23	1493.96	-6.72	-0.35
	(327.84)	(324.10)		{0.38}
Population (2016)	1481.80	1487.12	-5.32	-0.28
	(324.60)	(324.39)		{0.40}
% Spanish Population (2015)	84.15	83.90	0.25	0.55
	(8.48)	(7.25)		{0.38}
% Spanish Population (2016)	83.12	82.79	0.33	0.68
	(8.85)	(7.63)		{0.37}
% with low shop density (2016)	24.25	25.58	-1.33	-0.52
	(42.89)	(43.68)		{0.32}
Turnout (2015)	72.52	72.77	-0.25	-0.78
	(5.79)	(5.22)		{0.47}

Notes: In 2016, the most voted party was ECP (En Comú Podem), followed by PSC (Partit dels Socialistes de Catalunya), which chose not to use the slots assigned. Therefore, I use the third most-voted party this year, ERC (Esquerra Republicana de Catalunya). All variables are from 2015, before any of the two elections, except for the shop density variable, for which data is only available from 2016 onward. Average household size is the average number of residents (children included) in a household in that section. Low shop density is a binary variable equal to 1 if the number of shops per square meter is below the 20th percentile of the city's distribution. Randomization-inference p-values are in curly brackets. Standard errors are in parentheses. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table OA.28. **Balance Table – Two Most Voted Parties (2019), 500m Buffer, Part 1**

	Most Voted Party	2nd Most Voted Party	Difference	t-statistic
Avg. Household % Income – Wage (2015)	59.21	59.54	-0.33	-0.99
	(5.42)	(5.54)		{0.24}
Avg. Household % Income – Wage (2019)	60.72	60.72	-0.00	-0.01
	(5.56)	(4.77)		{0.44}
Avg. Household % Income – Unemployment Benefits (2015)	1.74	1.61	0.13***	2.97
	(0.74)	(0.63)		{0.20}
Avg. Household % Income – Unemployment Benefits (2019)	1.20	1.12	0.08***	2.74
	(0.53)	(0.48)		{0.22}
Avg. Household Income (2015)	36517.76	37413.00	-895.24	-1.53
	(10628.88)	(8885.06)		{0.31}
Avg. Household Income (2019)	40857.50	41999.15	-1141.65*	-1.75
	(11813.41)	(9965.23)		{0.28}
% Households Income<40% Median (2015)	8.07	7.86	0.21	1.03
	(3.55)	(3.41)		{0.40}
% Households Income<40% Median (2019)	7.22	7.02	0.20	1.11
	(3.03)	(3.04)		{0.38}
% Households Income>160% Median (2015)	40.48	43.04	-2.56***	-3.24
	(13.89)	(12.39)		{0.17}
% Households Income>160% Median (2019)	38.51	41.46	-2.95***	-3.66
	(14.31)	(12.58)		{0.13}

Notes: In 2019, the most-voted party was ECP (En Comú Podem), followed by PSC (Partit dels Socialistes de Catalunya). All variables are from 2015, before the two elections. Average % Income from Wage refers to the combined household income that comes from work wages and not other sources of income – e.g. unemployment subsidies. % Households Income<40% Median refers to the share of households whose annual combined income is below 40% on the national median income. Standard errors are in parentheses. Randomization-inference p-values are in curly brackets. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table OA.29. **Balance Table – Two Most Voted Parties (2019), 500m Buffer, Part 2**

	Most Voted Party	2nd Most Voted Party	Difference	t-statistic
80:20 Ratio (2015)	2.98	3.03	-0.05*	-1.88
	(0.44)	(0.40)		{0.21}
80:20 Ratio (2019)	2.83	2.86	-0.03	-1.41
	(0.41)	(0.33)		{0.30}
% Pop > 64 (2015)	22.56	21.94	0.62**	2.26
	(4.83)	(4.29)		{0.08}
% Pop > 64 (2019)	22.53	21.96	0.56**	1.97
	(4.85)	(4.63)		{0.10}
% Pop < 18 (2015)	14.42	14.27	0.15	1.00
	(2.71)	(2.40)		{0.38}
% Pop < 18 (2019)	14.22	14.10	0.12	0.77
	(2.72)	(2.39)		{0.44}
Average Age (2015)	44.67	44.44	0.23	1.64
	(2.44)	(2.26)		{0.14}
Average Age (2019)	44.78	44.50	0.28*	1.94
	(2.43)	(2.31)		{0.11}

Notes: In 2019, the most-voted party was ECP (En Comú Podem), followed by PSC (Partit dels Socialistes de Catalunya). All variables are from 2015, before the two elections. Average Age is the average age of the household. Standard errors are in parentheses. Randomization-inference p-values are in curly brackets. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table OA.30. **Balance Table – Two Most Voted Parties (2019), 500m Buffer, Part 3**

	Most Voted Party	2nd Most Voted Party	Difference	t-statistic
Average Household Size (2015)	2.38	2.36	0.02**	2.07
	(0.16)	(0.16)		{0.18}
Average Household Size (2019)	2.38	2.35	0.03**	2.57
	(0.16)	(0.15)		{0.14}
Population (2015)	1475.30	1503.11	-27.81	-1.40
	(312.13)	(338.06)		{0.13}
Population (2019)	1498.23	1524.66	-23.43	-1.28
	(327.20)	(350.86)		{0.13}
% Spanish Population (2015)	84.81	84.24	0.57	1.30
	(6.33)	(7.78)		{0.30}
% Spanish Population (2019)	80.26	79.90	0.36	0.69
	(8.00)	(8.82)		{0.37}
% Sections with low shop Density (2016)	20.12	12.87	7.25***	3.29
	(40.12)	(33.52)		{0.10}
Turnout (2015)	72.86	72.94	-0.08	-0.27
	(5.17)	(5.20)		{0.53}

Notes: In 2019, the most-voted party was ECP (En Comú Podem), followed by PSC (Partit dels Socialistes de Catalunya). All variables are from 2015, before the two elections, except for the shop density variable, for which data is only available from 2016 onward. Average household size is the average number of residents (children included) in a household in that section. Low shop density is a binary variable equal to 1 if the number of shops per square meter is below the 20th percentile of the city's distribution. Standard errors are in parentheses. Randomization-inference p-values are in curly brackets.***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table OA.31. **Balance Table – Left and Right-Wing Parties (2016), 500m Buffer, Part 1**

	Left	Right	Difference	t-statistic
Avg. Household % Income – Wage (2015)	58.93	59.34	-0.41	-1.47
	(5.60)	(5.55)		{0.09}
Avg. Household % Income – Wage (2016)	59.52	59.95	-0.47	-1.49
	(5.73)	(5.63)		{0.10}
Avg. Household % Income – Unemployment Benefits (2015)	1.72	1.71	0.01	0.27
	(0.78)	(0.73)		{0.45}
Avg. Household % Income – Unemployment Benefits (2016)	1.45	1.43	0.02	0.44
	(0.68)	(0.63)		{0.41}
Avg. Household Income (2015)	37207.89	37038.70	169.19	0.30
	(11326.64)	(10702.12)		{0.41}
Avg. Household Income (2016)	37961.97	37762.27	199.69	0.35
	(11714.16)	(11057.53)		{0.41}
% Households Income<40% Median (2015)	8.27	8.02	0.27	1.31
	(4.02)	(3.74)		{0.24}
% Households Income<40% Median (2016)	8.10	7.83	0.27	1.51
	(3.82)	(3.47)		{0.21}
% Households Income>160% Median (2015)	40.89	41.11	-0.22	-0.31
	(14.79)	(13.76)		{0.43}
% Households Income>160% Median (2016)	42.12	42.39	-0.27	-0.37
	(14.94)	(13.88)		{0.42}

Notes: All variables are from 2015, before the two elections. Average % Income from Wage refers to the combined household income that comes from work wages and not other sources of income – e.g. unemployment subsidies. % Households Income<40% Median refers to the share of households whose annual combined income is below 40% on the national median income. En Comú Podem (ECP) and Esquerra Republicana de Catalunya (ERC) are considered left-wing parties. Ciutadans (Cs), Convergència Democràtica de Catalunya, and Partit Popular (PP) are considered right-wing parties. Standard errors are in parentheses. Randomization-inference p-values are in curly brackets. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table OA.32. **Balance Table – Left and Right-Wing Parties (2016), 500m Buffer, Part 2**

	Left	Right	Difference	t-statistic
80:20 Ratio (2015)	3.03	2.99	0.04	1.37
	(0.48)	(0.48)		{0.16}
80:20 Ratio (2016)	3.03	2.99	0.04	1.43
	(0.50)	(0.49)		{0.14}
% Pop > 64 (2016)	22.24	22.28	-0.04	-0.15
	(4.84)	(4.85)		{0.46}
% Pop < 18 (2015)	14.58	14.67	-0.09	-0.60
	(2.80)	(3.17)		{0.31}
% Pop < 18 (2016)	14.75	14.83	-0.08	-0.53
	(2.81)	(3.18)		{0.33}
Average Age (2015)	44.42	44.43	-0.01	-0.10
	(2.47)	(2.56)		{0.48}
Average Age (2016)	44.47	44.51	-0.04	-0.25
	(2.48)	(2.58)		{0.44}

Notes: All variables are from 2015, before the two elections. Average Age is the average age of the household. En Comú Podem (ECP) and Esquerra Republicana de Catalunya (ERC) are considered left-wing parties. Ciutadans (Cs), Convergència Democràtica de Catalunya, and Partit Popular (PP) are considered right-wing parties. Standard errors are in parentheses. Randomization-inference p-values are in curly brackets. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table OA.33. **Balance Table – Left and Right-Wing Parties (2016), 500m Buffer, Part 3**

	Left	Right	Difference	t-statistic
Average Household Size (2015)	2.39	2.40	-0.01	-0.25
	(0.18)	(0.18)		{0.39}
Average Household Size (2016)	2.38	2.38	-0.00	-0.33
	(0.18)	(0.18)		{0.37}
Population (2015)	1484.81	1472.65	12.16	0.75
	(329.74)	(313.59)		{0.28}
Population (2016)	1478.97	1467.01	11.96	0.74
	(326.94)	(312.20)		{0.29}
% Spanish Population (2015)	84.07	84.91	-0.84**	-2.08
	(8.47)	(7.34)		{0.19}
% Spanish Population (2016)	83.03	83.91	-0.88**	-2.10
	(8.82)	(7.70)		{0.18}
% With low shop Density (2016)	25.40	29.32	-3.92*	-1.74
	(43.56)	(45.55)		{0.09}
Turnout (2015)	72.43	72.86	-0.43	-1.53
	(5.79)	(5.27)		{0.31}

Notes: All variables are from 2015, before the two elections, except for the shop density variable, for which data is only available from 2016 onward. Average household size is the average number of residents (children included) in a household in that section. Low shop density is a binary variable equal to 1 if the number of shops per square meter is below the 20th percentile of the city's distribution. En Comú Podem (ECP) and Esquerra Republicana de Catalunya (ERC) are considered left-wing parties. Ciutadans (Cs), Convergència Democràtica de Catalunya, and Partit Popular (PP) are considered right-wing parties. Standard errors are in parentheses. Randomization-inference p-values are in curly brackets. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table OA.34. **Balance Table – Left and Right-Wing Parties (2019), 500m Buffer, Part 1**

	Left	Right	Difference	t-statistic
Avg. Household % Income – Wage (2015)	58.95	58.78	0.18	0.64
	(5.66)	(5.60)		{0.27}
Avg. Household % Income – Wage (2019)	60.43	59.98	0.45	1.51
	(5.96)	(6.05)		{0.10}
Avg. Household % Income – Unemployment Benefits (2015)	1.71	1.57	0.13***	3.67
	(0.79)	(0.71)		{0.04}
Avg. Household % Income – Unemployment Benefits (2019)	1.18	1.09	0.09***	3.35
	(0.57)	(0.52)		{0.05}
Avg. Household Income (2015)	37588.56	39137.65	-1549.10***	-2.64
	(11924.23)	(11984.06)		{0.05}
Avg. Household Income (2019)	42172.13	43954.66	-1782.53***	-2.67
	(13499.08)	(13661.70)		{0.05}
% Households Income<40% Median (2015)	8.12	7.82	0.30	1.65
	(3.90)	(3.59)		{0.18}
% Households Income<40% Median (2019)	7.29	7.04	0.25	1.59
	(3.39)	(3.12)		{0.21}
% Households Income>160% Median (2015)	41.20	43.80	-2.60***	-3.67
	(14.84)	(14.06)		{0.03}
% Households Income>160% Median (2019)	39.46	42.22	-2.76***	-3.78
	(15.31)	(14.45)		{0.03}

Notes: All variables are from 2015, before the two elections Average % Income from Wage refers to the combined household income that comes from work wages and not other sources of income – e.g. unemployment subsidies. % Households Income<40% Median refers to the share of households whose annual combined income is below 40% on the national median income. En Comú Podem (ECP), Esquerra Republiana de Catalunya (ERC) and Partit dels Socialistes de Catalunya (PSC) are considered left-wing parties. Ciutadans (Cs), Convergència Democràtica de Catalunya, and Partit Popular (PP) are considered right-wing parties. Standard errors are in parentheses. Randomization-inference p-values are in curly brackets. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table OA.35. **Balance Table – Left and Right-Wing Parties (2019), 500m Buffer, Part 2**

	Left	Right	Difference	t-statistic
80:20 Ratio (2015)	3.01	3.06	-0.05**	-2.04
	(0.48)	(0.47)		{0.07}
80:20 Ratio (2019)	2.85	2.91	-0.05**	-2.51
	(0.42)	(0.41)		{0.04}
% Pop > 64 (2015)	22.20	22.12	0.08	0.33
	(4.84)	(4.55)		{0.39}
% Pop > 64 (2019)	22.14	22.10	0.04	0.17
	(4.90)	(4.74)		{0.44}
% Pop < 18 (2015)	14.75	14.68	0.07	0.44
	(2.97)	(3.03)		{0.40}
% Pop < 18 (2019)	14.56	14.51	0.05	0.34
	(2.95)	(3.07)		{0.43}
Average Age (2015)	44.40	4.40	-0.00	-0.03
	(2.52)	(2.39)		{0.51}
Average Age (2019)	44.50	44.47	0.03	0.24
	(2.51)	(2.41)		{0.41}

Notes: All variables are from 2015, before the two elections. Average Age is the average age of the household. En Comú Podem (ECP), Esquerra Republiana de Catalunya (ERC) and Partit dels Socialistes de Catalunya (PSC) are considered left-wing parties. Ciutadans (Cs), Convergència Democràtica de Catalunya, and Partit Popular (PP) are considered right-wing parties. Standard errors are in parentheses. Randomization-inference p-values are in curly brackets. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

Table OA.36. **Balance Table – Left and Right-Wing Parties (2019), 500m Buffer, Part 3**

	Left	Right	Difference	t-statistic
Average Household Size (2015)	2.40	2.39	0.01	0.87
	(0.19)	(0.19)		{0.28}
Average Household Size (2019)	2.39	2.39	0.00	0.84
	(0.18)	(0.18)		{0.30}
Population (2015)	1481.75	1473.54	8.21	0.52
	(330.77)	(309.96)		{0.32}
Population (2019)	1505.18	1494.24	10.93	0.67
	(344.49)	(324.82)		{0.26}
% Spanish Population (2015)	84.60	84.50	0.10	0.26
	(7.98)	(7.78)		{0.46}
% Spanish Population (2019)	80.18	80.03	0.15	0.33
	(9.48)	(9.37)		{0.43}
% With low shop Density (2016)	24.28	23.39	1.00	0.48
	(42.96)	(42.36)		{0.44}
Turnout (2015)	72.68	73.06	-0.39	-1.44
	(5.61)	(5.35)		{0.58}

Notes: All variables are from 2015, before the two elections, except for the shop density variable, for which data is only available from 2016 onward. Average household size is the average number of residents (children included) in a household in that section. Low shop density is a binary variable equal to 1 if the number of shops per square meter is below the 20th percentile of the city's distribution. En Comú Podem (ECP), Esquerra Republiana de Catalunya (ERC) and Partit dels Socialistes de Catalunya (PSC) are considered left-wing parties. Ciutadans (Cs), Convergència Democràtica de Catalunya, and Partit Popular (PP) are considered right-wing parties. Standard errors are in parentheses. Randomization-inference p-values are in curly brackets. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.