The Effects of Exposure to Electoral Advertising: Evidence from Spain*

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Abstract

I measure the effects of street-level political advertising on voting behavior. I use a novel dataset on ad location in a major Spanish city during elections for the national parliament as well as granular socio-economic and voting data. This set-up, where more than two parties are running for office and elections are very competitive, allows me to explore the heterogeneous effects of ads across parties as well as how parties' ads affect other parties' vote shares. To identify the effects of parties' ads, I exploit a legally mandated randomized assignment of ad location to parties across multiple years. I find that a party's own ads have a positive effect on its vote share, although the effects are heterogeneous across parties. A one standard deviation increase in the number of ads increases a party's vote share by 0.87 percentage points on average. Ads of parties with ideologically distant platforms consistently have a negative effect on a party's vote share. In contrast, ads of parties that are close competitors may act either as complements or substitutes in different years.

Keywords: Advertising; Electoral campaigns; Political parties; Voting.
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Introduction

Political advertising makes up for a sizeable share of political parties' budgets, especially during an election year. For the November 2020 Presidential elections in the United States, experts estimated that political ad spending would be close to reaching $10 billion (Bruell 2019). In order to spend such sums of money, parties must believe that campaigning and electoral ads have some effect on voting behavior. This widespread belief must also underlie the fact that, in many countries, spending on electoral advertising is not only partially funded by the state, but also regulated. Indeed, the campaign regulation has repeatedly come under discussion, especially with the surge of online ads.[1] More recently, this discussion has centered around the sources of party and campaign finance and how interest groups use their resources to influence campaigns and politics (Cagé 2020).

To understand whether and how political advertising should be regulated, it is crucial to understand how it affects voting behavior. However, when it comes to the effects that political ads have on vote shares, there is little evidence that is both clearly identified and uses real voting data and ads from actual electoral campaigns. When parties choose different campaigning strategies for different locations — e.g. running a given ad in specific location and not in another — this may be because of they expect different electoral returns, rendering campaigning strategies endogenous to the location. Thus, comparing differences in electoral behavioral to differences in political ads across different locations does not allow a causal interpretation due to endogeneity concerns.

This paper uses data on legally mandated randomized location of street-level political ads to identify and characterize the effects of partisan ads on voting behavior in the context of a multiparty system. I study the effects that partisan ads have on a party's vote share — both own ads and ads by other parties — as well as how the effects of competitors' ads depend on degree of their ideological similarity. I obtain two key findings. First, I show that a party's own ads have a positive effect on its vote share. And second, I find that while ads of other ideologically distant parties always have a negative effect, ads of close competitors can act as complements or substitutes possibly reflecting parties' campaigning strategies.

In order to estimate these effects I construct a novel dataset detailing the location of street-level ads in the city of Barcelona, the second most populated city in Spain. Street-level ads consti-

[1] Parker (2020), Dommett (2020), and Jaursch (2020).

tute an important part of the electoral campaign period, both socially[2] and in terms of parties' expenditure, amounting to several millions of euros — all of which is state-subsidized (e.g. Tribunal de Cuentas 2016, 2017). Moreover, more than two parties effectively contest the election and can credibly dispute a significant share of the votes. These parties have platforms that represent different areas of the ideological spectrum which can lead to ads having different cross-party effects.

While the use of any media by parties is regulated by Spanish law, this paper's identification strategy relies on legal and administrative constraints of street-level ads that are particular to the city of Barcelona. I exploit the fact that the assignment of ad locations to parties is randomized, being determined by the outcome of a lottery. Moreover, the number and the location of street-level ads is decided administratively and not by the parties themselves. Furthermore, the design and content of ads is the same country-wide and not tailored to the location.

I then combine the street-level ad data with voting results and socio-demographic data at the census section level, the smallest administrative unit available that usually corresponds to a single voting booth. A section simultaneously identifies a small number of voting booths (typically a single one) and a group of contiguous city blocks, typically one or two blocks. I use two different national-level elections, held in June 2016 and April 2019, which also cover the rise of several new or previously marginal parties into a significant position at the national scale. This is, therefore, an ideal setting to study how parties' ads may affect not only their own but also other parties' vote shares. Finally, I complement this with survey data on how individuals position parties on the left-right spectrum to define ideological similarity across parties.

Using the detailed dataset on ad location together with geo-spatial data regarding the location of census sections, I measure ad exposure at the section level. I only focus on the effect of local ads, that is, on the ads near the section where voters live. Since sections tend to be quite small in size, counting only the ads located within the section would not fully capture the range of ads that voters would be exposed to on a regular basis in the vicinity of their residence. Hence, I consider a buffer of influence around the section as the area where inhabitants of that section are likely to see the ads often in a period of two weeks, which is the length of election campaigns in Spain.

[2]For instance, candidates typically attend the first poster being put up at the beginning of the campaign, sometimes even doing it themselves, what is then often used by television news broadcasts as a starting segment on the first day of the electoral campaign.

I find that parties' own-ad density has a positive effect on a party's vote share in a given year. This is consistent with the results found of the literature (Larreguy et al. 2018; Spenkuch and Toniatti 2018) and also holds when using the number of ads instead of ad density. In particular, I find that, on average, a one standard deviation in a party's number of ads in a given section would increase that party's vote share by 0.61 percentage points in 2016 and by 0.96 percentage points in 2019. Furthermore, a section being exposed to only ads of a given party increases that party's votes share by 5 percentage points.

However, further analysis uncovers substantial heterogeneity in the effects of own ads across parties. Examining each party individually, I show that the effect of increasing own-ad density by one standard deviation varies significantly not only across parties, ranging from a -1.22 percentage point decrease on vote share to a 2.31 percentage point increase. Moreover, while the average effect of own-ad density remains largely unchanged in the two elections I analyze, the party-specific effects may turn from positive to negative and vice-versa across the different elections. This suggests that voters might have averse reactions to a party's candidates running for office in a given year or to the slogans the party uses for that campaign, which is the information most prominently featured in this type of ads and provide no hard information on the political platforms.

When analyzing cross-party ad effects, I find that ads of other parties have a statistically significant effect on a party's vote share, but its sign and magnitude depends on the degree of ideological similarity between the different parties. I use voters' perception of the location of parties on two different policy scales — left to right and the party's stance on regional autonomy — in order to categorise parties as being either "close" or "distant". On the one hand, ads of parties that are ideologically distant are found to always have a negative effect on a party's vote share. On the other hand, the effect of the ads of ideologically close parties changes across years. In 2016, they have a positive effect on a party's vote share, that is they act as complements. In contrast, in 2019, they have a negative effect, acting as substitutes. This suggests changing campaign and political strategies may play a significant role in shaping the effects that political advertising has on voters. In support of this hypothesis, I provide anecdotal evidence suggesting that parties had very different strategies — more combative or more converging — with respect to their stance towards ideologically-akin parties in these elections.

I then explore how the effects of (own) ads depend on socio-demographic characteristics of the electorate. Ads are less effective in increasing a party's vote share in sections with a higher

income and in those with a relatively older population. As income tends to be strongly correlated with education, it is possible that the diminished effect of partisan ads on higher income votes is due to a lower cost of obtaining information by voters with higher educational attainment and, consequently, a lower sensitivity to ads. A lower sensitivity to ads by older voters can be similarly due to the fact that such voters are better acquainted with the existing political parties or potentially more entrenched in their political positions. Finally, I find no effects of neighborhood economic activity, which I proxy with shop density.

Having data on the ad location and electoral results across several years also allows me to estimate the effects that ad exposure has on turnout. Between the years 2016 and 2019, there were some changes in which streets were selected to host political ads. Overall, 6.6% of the areas were not exposed to ads, 1.8% of the areas were only exposed to ads in 2016 and 3.3% only in 2019. Using this variation across the areas that were exposed to ads, I define a treatment variable identifying such areas and run a difference in difference analysis to estimate the effect that ad density had on turnout. Consistently with most of the literature, an increase in exposure to partisan political ads is not associated with an increase in turnout.

In summary, the results in this paper confirm that a party's ads have, on average, a positive effect on its vote share. However, these effects vary greatly across parties, including cases for which a party's own ads have a negative effect on its vote share. This suggests that not only do ads affect voter behavior through a salience effect — where more ads draw more attention to that party — but also that the elements featured in the ads — the party's name, the main candidate — act as visual cues for voters that may yield positive or negative effects. Consistently, there is suggestive evidence in the political science literature that voters are very responsive to a candidate's appearance. Furthermore, I find that ads of competing parties matter for a party's vote share, and whether they are beneficial or detrimental depends not only on their ideological similarity but also on contextual aspects to the campaigns specific to the election in question. This indicates that the broader political context and discourse throughout the campaign may affect how voters perceive and are affected by other parties' ads, especially for parties that are ideologically more similar. Whether these parties are seen as potential allies to pass laws and even form a government, or rather as "substitutes" may fundamentally depend on how the parties themselves confront these issues during the campaign.

Literature Review

This paper contributes to the literature on the effects of political ads on voting behavior, that is, on vote shares and turnout.

Effects of partisan ads on relative vote shares

The closest papers are Kendall et al. (2015), Galasso et al. (2020), Green et al. (2016) and Gerber et al. (2011), who use actual exogenous variation in the assignment of ads to identify the effects of political ads, albeit by implementing field experiments.

In Kendall et al. (2015), the authors design two different campaign ads for one of the candidates running for mayor in a city in Italy, the incumbent. One emphasizes the candidate's valence and the other his ideology. Then, they randomize the electoral precincts that receive electoral mail or phone calls with either one of those two messages, both or none. They use voting data from that election and find that campaigning efforts increase the incumbent's vote share by four percentage points, but only for precincts where voters were contacted by phone and emphasizing the valence of the candidate. They supplement their analysis with survey data.

More recently, Galasso et al. (2020) conducted a field experiment during a mayoral election in an Italian city, where they find that negative ads benefit the candidate that does neither uses or is the target of such ads. They further confirm this result by running a controlled laboratory experiment. Similarly, Green et al. (2016) conduct a field experiment where they randomize the precints where lawn signs of a candidate are planted for several races in the United States. They find that in the case of a close congressional race with an ad displaying ideological cues, the presence of lawn signs increases the vote share of the candidate by four percentage points. Also, Gerber et al. (2011) randomly varied the start of the campaign for the incumbent as well as the amount of ads purchased across different designated media areas in the United States, during the Texas gubernatorial race of 2006. Using survey data, they find that although exposure to ads has a positive effect on the party's reported vote intention, this effect disappears within a week.

In all of the aforementioned papers, researchers directly intervened in the running of the campaign of one of the candidates, and in two they supervised and participated in the design of the ads. This could arguably change the nature of the ads compared to those that the candidates' campaigns would design and use in absence of such intervention. In contrast, in this paper, the exogenous randomization on which my identification strategy relies is due to the allocation mechanism inherent to the city of Barcelona and that, to the best of my knowledge, has been

in place since 1986. All parties that display ads in the spaces hosted by the municipality must abide by the outcome of the randomized allocation. The nature of the ads chosen by the parties is also different, as these ads do not contain hard information about the candidates — as opposed to the ones designed by the researchers —, but are instead merely suggestive and appealing to specific emotions. Finally, since I consider the case of the second most populated city in Spain, the number of observations is significantly higher than those in Kendall et al. (2015) and Galasso et al. (2020), which allows me to have more precise estimates.

Other, less related papers estimate the effects of ads on voting behavior during elections by exploiting the variation in exposure to ads across different media markets or media coverage. Spenkuch and Toniatti (2018) relies on the assumption that two counties in the United States that are on different sides of designated media area borders, but within the same state, are going to be exposed to a different ad share distribution of parties. They find that a one standard deviation increase in the difference in ad shares increases the difference in vote shares by 0.5 percentage points.

Similarly, Larreguy et al. (2018) rely on the fact that in Mexico the shares of electoral ads in a given AM radio channel depend on the state from which the channel is emitted. The authors then assume that differences in the share of ads for neighboring precincts originates from cross-state spillovers in antenna signals are exogenous and directly estimate the average effect of exposure to political advertising from each political party on vote shares. They find that a one standard deviation in increase in campaign advertising increases vote shares by two to three percentage points. They also find that ads were more successful at increasing the number of votes of a given party among electorates in less developed areas and that it is most useful for non-dominant parties.

As the authors of the above papers themselves recognize, boundaries of exposure to media markets and radio coverage are not sharp. For instance, as mentioned earlier, it is very likely that local stations have significant viewership outside its corresponding media market, as documented in Federal Communications Commision (2017) for the United States. Thus, the intensity of the signal decays smoothly, implying that the signal coverage is in fact similar for neighboring locations. Moreover, given that the positioning of the signals' sources is potentially correlated with underlying socio-demographic variables, identification strategies based on discontinuity arguments in media markets are at the very least susceptible to endogeneity concerns. I overcome this issue

by relying on actually randomized allocation of partisan ads, adding section fixed effects, as well as testing and controlling for spatial correlation across different sections.

Differently, Da Silveira and De Mello (2011) exploit the induced change in ad shares inherent to political advertising regulations in gubernatorial elections in Brazil. In the first round of elections, ad shares are proportional to the past vote share of parties in the most recent national election whereas in the second round ad shares are evenly split between the two runner-off. Based on a differences-in-differences strategy, the authors find that a one percentage point increase in time share leads to a 0.27 percent increase in vote share. However, there is a potential endogeneity problem: a party's past electoral performance at a national level directly affects ad shares in the first round and strongly correlates with their past performance in gubernatorial races, which can indicate a potential omitted variable bias. Beyond developing an identification strategy that is arguably cleaner, I focus on a multi-party system where seven to nine parties display ads, where no party has more than 27%, and most parties have between 10 and 20% of the vote shares. This not only allows me to explore the potentially heterogeneous effects of ads across party and party type – e.g. left-wing or right-wing parties – but also estimate the effects of cross party ads. That is, whether ads of other parties have an effect on a party's vote shares.

Effects of political ads on turnout

My paper also contributes to a different strand of the literature which explores the effect of political ads on electoral turnout. Regarding political but non-partisan ads, Green and Gerber (2015) review the outcomes of several field experiment where researchers designed non-partisan ads with the goal of increasing actual turnout. They find that some methods, such as personalized messages and social networks, were more effective than others like emails or phone banks.

With respect to partisan ads, Huber and Arceneaux (2007) show that ads have little or no effect on either voter's information on the candidate or on turnout, but that they increase the reported probability of intending to vote for the candidate. Accordingly, Freedman et al. (2004) reports that individuals who are exposed to electoral advertising are more likely to be more interested in the election, be more knowledgeable of the running candidates, and report to be more likely to vote. Both use survey data and thus are only indicative of voter's preferences after being exposed to the ads. My results suggest that instead partisan ads have no effect on turnout, what is consistent with other existing work that also uses actual voting data (Kendall et al. 2015).

Types of ads

A third, less directly related strand of this literature has also examined the tonal aspect of the ads. Brader (2005) uses a laboratory setting to conduct two experiments where subjects were exposed to two different types of ads: one designed to instill enthusiasm and optimism and the other to induce fearfulness and vigilance. This was done through the addition of non-verbal cues — images and sounds. My data provides supports that ads without explicit information as to the valence of the candidate or the party's platform may still affect voting behavior. The heterogeneity observed across parties and elections in my results suggest ads may act as a visual cue that may emphasize certain aspects of the party or remind of the overall context of the electoral campaign.

The remainder of the paper is organized as follows: Section 1 summarizes the key elements of the Spanish Electoral System and the regulation of electoral campaigns. Then, Section 2 describes the datasets used, while Section 3 details the main aspects of measuring ad exposure and the identification strategy used. Finally, Section 4 presents the results, and Section 5 concludes.

1. Background on the Spanish Electoral System

This section covers the most relevant institutional details relating to elections and political advertising in Spain.

1.1. Electoral Law and Campaign Regulation in Spain

Spain has a proportional representation system with closed lists and multiple electoral districts, where a party can choose to run in any given district with a set list of candidates. In order to be considered for the allocation of seats in a given districts, parties must obtain at least 3% of the votes in that district,[3] and then seats are allocated following the D'Hondt method.

National elections are usually held every four years, but early elections can be called by the government at any time. Spain's national legislature is constituted by two separate chambers, the parliament and the senate. Elections for the lower and upper chamber are held simultaneously, but parties' campaigning efforts focus solely on candidates running for parliament.

The national law regulating electoral advertising imposes restrictions on almost every aspect of advertising, and is strict regarding the timing of the campaign. The period of electoral campaign lasts for 15 days, ending at midnight on the day prior to the election. On election day and the day before that parties cannot hold rallies and no ads are shown on any media. However, street-level

[3] To compute this percentage all valid votes to political parties as well as blank votes are counted.

ads are still displayed during those two days. Furthermore they also impose restrictions on parties as to where, when, and the quantity of electoral advertising parties are allowed for essentially all types of available media — for more details, see Appendix A. Finally, at no other time do parties have posters on the streets, TV ads, or send in mails to voters.

The law establishes two rules that must be followed with regards to street-level advertising. First, any party or coalition that requests to have street-level advertising must be given some. Second, the percentage of total ads a party has must be proportional to their vote share in the most recent comparable election in that district. This means that for the 2016 national elections, the percentage of ads for each party was determined by their results in the 2015 national elections. If the party did not run or did not exist at the time of the previous elections, some space must be allocated to them. The actual amount is not regulated at the national level and is up to the municipalities to decide.[4] This means that, other than this proportionality rule, each municipality is free to choose the method used to allocate ad locations to parties.

All types of advertising spending are heavily subsidized by the central government, the amount depending on the party's results of that election.

In terms of street-level advertising, the allocation is organized at the municipal level and by the Junta Electoral de Zona (JEZ), an independent body which is the local representation of the electoral commission. In the months prior to the election the municipal townhall itemizes the spaces that are available to parties to post their ad, these are sent to the JEZ as well as to all parties running for the election.For a discussion and evidence that the mayor's party is unlikely to have manipulated the location of the ad locations see Appendix C. Parties can then notify the JEZ that they want to be part of the allocation process. Once this is settled, around six weeks prior to the elections all parties concerned receive a notification as to the date and location where the distribution of ad spaces will take place. This distribution usually occurs ten days to two weeks before the start of the electoral campaign.

On the day of the allocation, representatives of the municipal administration, the JEZ, and party representatives meet to witness the allocation of all ad spots, which include banners and posters.[5] 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 been remained

[4]In Barcelona, a party that did not run in the previous election is entitled to one poster and one banner segment.

[5]Banners are placed on street lighting. Usually banners in street lighting are used to advertise municipal policies or regulations, as well as cultural activities. They can also be left empty. Posters are larger than banners and are placed also by the street where usually ads for firms are placed.

empty. Moreover, it is customary to leave two to three ad locations empty in case a party decides to protest the allocation and it is given more space. This did not happen in any of the elections considered in this paper.

This paper focuses on the city of Barcelona, which is the second most populated city of Spain and the second province in terms of yearly GDP. The city also belongs to the electoral district of Barcelona, although it only represents 30% of its population. Therefore, how the overall city votes in a given election has only a partial effect on the distribution of ads across parties in the following election.

In Barcelona the ad allocation for street-level advertising is done using a lottery system. Parties and coalitions get a number of lottery tickets that is proportional to the vote share in the previous comparable election. Each ticket represents either a location for one poster or a street segment with a given number of banners. Two different lotteries are drawn for both posters and banner segments. The location of the ads has previously been decided by the municipality. This means that, for banners, the randomization is not done at the ad level but at the segment level.

Parties face no restrictions in terms of the content of the ads they display. They also do not have any constraints as to what ads go in which location — other than those given by the size of the space allocated.[6] Nevertheless, in the case of banners there is the custom that a party will have two to six different designs for the banners which will be shown on sequential lampposts. Since all banner segments have at least over 20 banner spots allocated to them, all voters in areas that are exposed to banners will see exactly the same ads. This is a practice that is not only common to Barcelona but also to all cities in Spain. When it comes to posters, parties also have different designs available which they could place strategically in certain spots of the city. In any case, posters contain very little additional information about the party with respect to banners.

1.2. The Spanish Party System in Barcelona

This paper uses data from two different national elections: the ones held in June 2016 and in April 2019. In 2015, elections were called for December as the legislature neared its four-year cycle.[7]

[6]Parties are also free to leave those spaces empty and these would not be occupied by other parties. Anecdotal evidence gathered from campaign organizers suggests that, if this were to happen, it would be the cases that all spaces would be left empty rather than strategically selecting some spaces to be left without ads.

[7]No data for the 2015 national elections was available.

In this election two new parties, Ciudadanos (Citizens, Cs)[8] and Podemos (We Can) secured a considerable vote share. At the same time, the two main parties in Spain, PP and PSOE, went from holding over 70% of the votes to barely 50%. Both PP and PSOE tried to form a government by securing the support of other parties but failed to do so within the established time limit for the parliament to elect a government. As a result, new elections were called for and were held in June 2016, in which parties emphasized the need to cooperate after the elections in order to avoid a third round of elections. In 2019, new elections were called by the government after an unsuccessful vote to pass the state's budget. More details about the circumstances surrounding those elections can be found on Appendix A.

In the context of Barcelona, the four aforementioned parties — Cs, Unidas Podemos (ECP), PP, PSOE (PSC) — ran in the district of Barcelona for the 2016 and 2019 elections.[9] For decades, PP — a right-wing party — and PSOE(PSC) — a left-wing party — had alternated in power in national government and consistently gathered over 70% of the vote shares. This ended in 2015 with the emergence of Cs and Podemos, another right-wing and left-wing party, respectively, which built much of their platform on the need to renovate politics in Spain. Another new party, VOX, created in 2013, also ran in the 2019 elections in the district of Barcelona for the first time. Moreover, in Barcelona there are two other parties that play a major role in regional politics that also ran in both elections: Convergència Democràtica de Catalunya (Democratic Convergence of Catalonia, CDC)[10] and Esquerra Republicana de Catalunya (Republican Left of Catalonia, ERC).

Even though their vote shares at the national level are not comparable to that of the four main parties, regional parties have enough support in the districts where they run to obtain enough MPs in national elections and sometimes be key to the law-making process. When the party that won the election does not have the absolute majority of the seats in parliament, it often turns to regional parties for support to form a government.

[8] Ciudadanos can be considered as a new party at the national scale, since this is the second time that it ran in electoral districts across Spain. It was created in 2006 and had contested European, regional and local elections in Catalonia, obtaining representation in the Catalan parliament. It had already run for the 2008 national elections in all of the 52 electoral districts in Spain with very little success, obtaining 0.18% of the votes.

[9] En Comú Podem (ECP) is a coalition of parties based in Catalonia and in a nation-wide coalition with Podemos. Its main candidate is different from Podemos' candidate and they have their own parliamentary group. Similarly, Partit dels Socialistes de Catalunya (PSC) is a party based in Catalonia that is federated with PSOE at the national level. When discussing the results of parties in Barcelona I will refer to ECP and PSC and when discussing the broader political context I will refer to Unidas Podemos and PSOE. More details in Appendix A.

[10] By 2019, CDC was called Partit Demòcrata Europeu Català (Catalan European Democratic Party) and in the 2019 elections it ran with a different name, Junts per Catalunya (Together for Catalonia), and included many independent candidates in their lists. For the sake of simplicity I will refer to this party as CDC in both years.

Finally, there are two other parties[11] that were allocated ad space in Barcelona in at least one out of the two elections. These are parties that either did not obtain representation at the national parliament or did not obtain any MP in the district of Barcelona to the national parliament. There are another five parties[12] that ran for the district of Barcelona in at least one of the two elections. These are parties that have had little support from the electorate, even compared to the parties that get the smallest amount of ads. In any case, these parties were not considered in the allocation of ads not because of their poor electoral performance in the previous comparable election, but because they did not request it. This is probably related to the fact that, even though they are not charged any fee for occupying space with their banners, they do have to pay for the expenses related to printing, installation, and removal of the ads.

2. Data

In this section I describe the data used, which includes electoral results, information about the location and distribution of political advertising at the street-level, and demographic and economic indicators.

The main dataset I use is the location of electoral ads in the cities of Barcelona for the 2016 and 2019 national elections, which is the second most populated city in Spain. The data for Barcelona 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 provided by the Instituto Nacional de Estadística (INE). These contain the outline of the streets, squares, and other geographies of Barcelona. Moreover, from INE I also obtain all the information relating to which areas of the cities belong to which census section — in 2016 and 2019 —, which is the unit of analysis.

A census section is one of the smallest administrative denominations and its geometry is determined by the population registered in the most recent Decennial Census which in this case took

[11] Front Republicà (FRONT) and Partit Contra el Maltractament Animal (PACMA)

[12] Convergents, Izquierda en Positivo, Partit Comunista dels Pobles de Catalunya, Partit Comunista dels Treballadors de Catalunya, and Recortes Cero - Grupo Verde.

[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 were the same.

place in 2011.[14] 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.[15]

I also use the voting data of the April 2016 and 2019 general elections at the voting booth level. The dataset contains information on overall population, the number of people registered to vote[16], the number of people who cast a vote, and whether that vote was blank, null, or for a given party. In most cases, each section is assigned to a single voting booth.[17]

As explained in Section 1, parties are allocated a given number of ads or segments of streets proportional to their results in the previous comparable elections. Table 1 and Table 2 show the allocation of the different types of ads across parties in Barcelona for the 2016 elections and 2019 elections, respectively. The two tables show that, indeed, for both types of ads and regardless of whether we use banners or the number of segments containing those banners, 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. Due to the random allocation of segments, it can be that a party with more segments has fewer banners than a party with less segments, as can be seen in Table 2. The maps of the distribution of the ads in Barcelona can be found in Figures A.4 to A.5 in Appendix B and the particular location of the ads is further discussed in Section 3.

There are a handful differences between the number of ads between 2016 and 2019. The total number of posters is the same in both years, 89, and the number of banners barely changes between both years — 5706 and 5827, respectively — but there were 63 banner segments in 2016 and 69 in 2019. As we can see in Figure 1a, there is a larger number of section that are located near 100 ads or less, but there also is a slightly larger frequency of sections that are located near over 300 ads in 2016 as compared to 2019.[18] This is due to the increase in the number of street segments available to post banners as well as the change in the streets in which banners were assigned to.

[14] See Table A.8 for a description of the distribution of population and size of census sections in Barcelona.
[15] There are 4 sections that have a minor change in its borders between 2016 and 2019. Two do not include any places of residence, one includes some scattered houses, and the last one changes in order to include a full apartment complex. All in all these changes should not affect much the population within those sections.
[16] All Spanish citizens are automatically registered as voters when they turn 18 or when obtaining the nationality.
[17] 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.
[18] For a more seamless comparison, a outlier value was taken out of the 2016 data for this particular graph. That section had little over 700 ads and distorted both graphs. The figure with all observation can be found in Appendix B, Figure A.9. In Figure **??**, displays the distribution of ads at the party level. The number of ads per section was computed using the 500m area of influence.

Table 1. **2016 Distribution of Electoral Campaign Space in Barcelona and Results of the Previous Elections**

	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 use the spaces assigned.

Table 2. **2019 Distribution of Electoral Campaign Space in Barcelona and Results of the Previous Elections**

	ECP	PSC	ERC	PP	CDC[1]	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	

[1] In that year, CDC — by then re-baptized as PDeCAT — ran under the name of Junts per Catalunya (JxCAT).
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 June 2019.

Another key difference between the 2016 and 2019 elections is that one of the parties, PSC, chose not to use the spaces it was assigned. This was a decision that was made at the national level in an effort to reduce campaign costs since this was the second general election in less than a year. Therefore, PSC's ads and vote shares from the 2016 elections will not be included in any of the analysis or tests performed that focus exclusively on parties that had electoral advertising. I found no evidence that any of the other major parties made a similar decision in either elections. The party's choices to use the spaces assigned to them will be further discussed in the upcoming sections.

I also use sociodemographic information available at the Atlas de la Renta, a project within INE that uses data from tax returns of the years 2015 to 2017. In particular, it contains indicators relating to income and its distribution within the census section, as well as different income sources. Moreover, it also has demographic indicators at the census section level related to the age distribution and size of households.

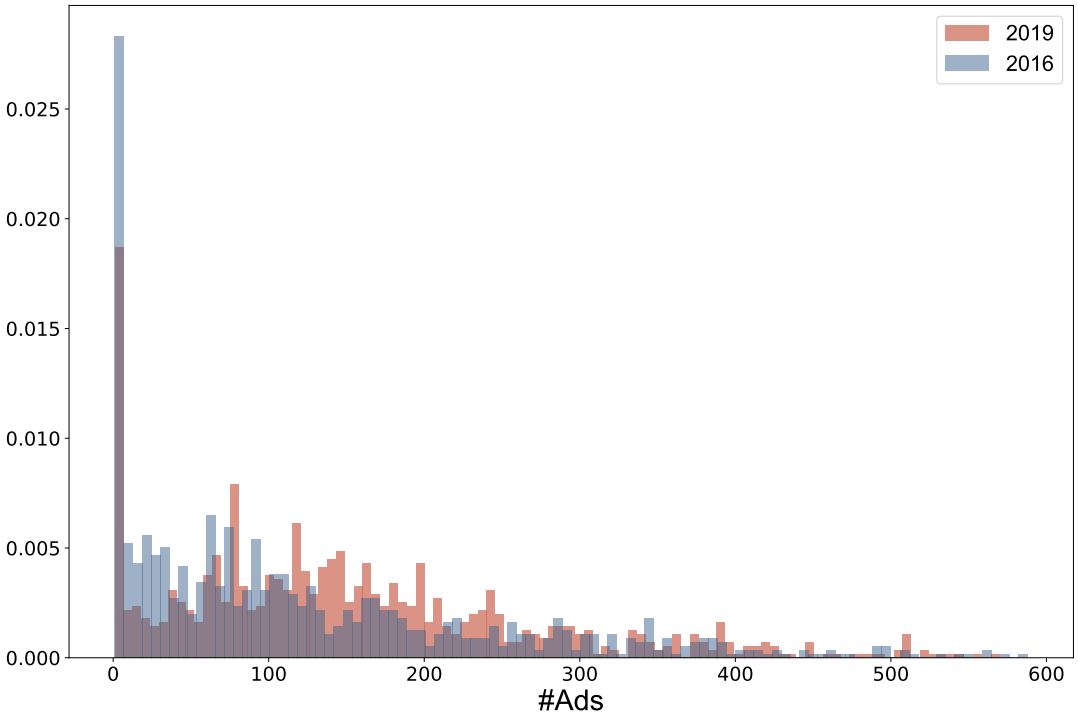
3. Empirical Strategy

3.1. Measuring Ad Exposure

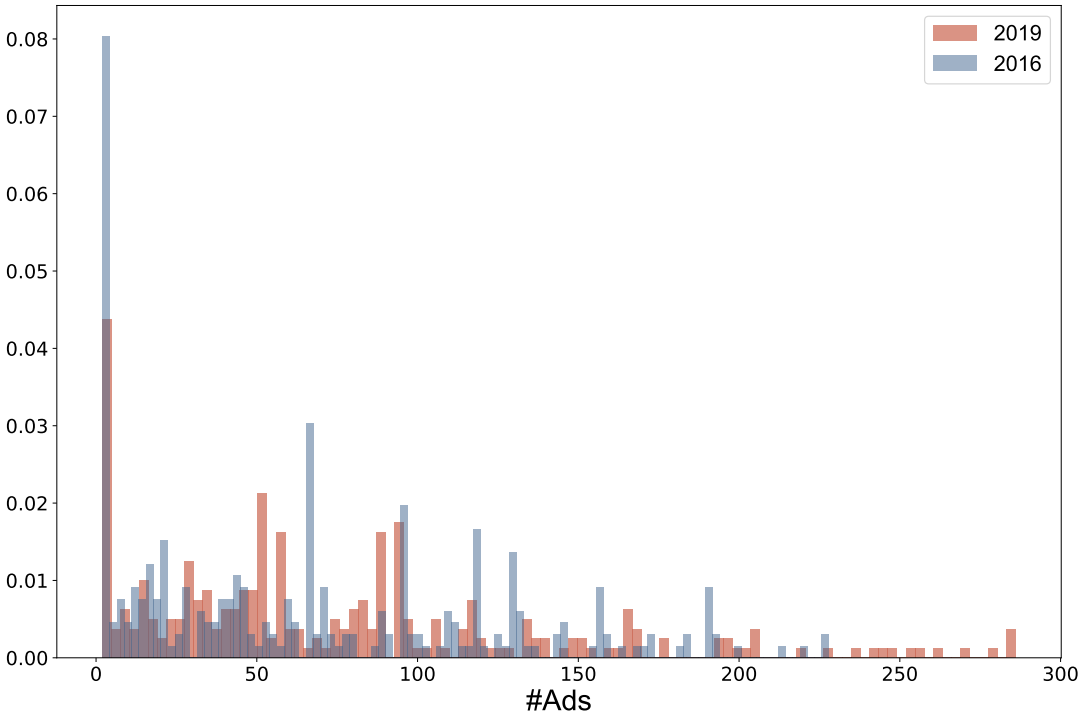
To create a measure of ad exposure, the first step is to locate the ads. Using the address information available in the original dataset, I geocode the location of banners and posters in the city for both elections – for more information see Appendix C.

Once located, the natural question arises as to which ads are seen by voters in a given section. In general terms census sections are rather small – representing 1% of the city's area on average –, so it is likely that voters are exposed to the ads within walking distance of the section they live in. Hence, I draw a buffer of 500m around each section that serves as an area of influence. As a robustness check I also use 300m and 400m buffers, which can be found in the Appendix. Two maps with examples of how the buffers are drawn can can be seen in the Appendix in Figures A.11 and A.12.

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's area of influence divided by its total area. I transform this variable so that it can be interpreted as the number of ads per $100m^2$. This is an absolute measure



(a) **Distribution of Ads across census sections (2016 & 2019)**



(b) **Distribution of Ads for Ciudadanos (Cs) across census sections (2016 & 2019)**

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.

Another interesting dimension of the effects of political advertising has to do with the concentration of ads in few or many parties. For instance, one could think that being exposed to a more evenly split share of ads among different parties could be associated with also a more split electorate. Hence, for each section and their respective areas of influence I compute the Herfindahl-Hirschman Index relative to the ad shares.

3.2. Identification

The core element of the identification strategy of this paper relies on the randomization of ad locations across parties ahead of each election. Hence, an important consideration is that, although ads are randomly assigned to locations, those locations are predetermined by the municipality in each election. The locations of ads induce a variation in the number of ads sections are exposed to, but that variation is not random. However, within a section with at least one poster or one banner segment, which party gets assigned that particular spot is random.

Once the ads are allocated to the parties, these 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. Moreover, all parties have very similar ads in terms of structure and content – see Figure A.3 for examples of banners. Concerning banners, parties usually have a set of 2 to 6 different banner designs. At least one of them prominently features the party's candidate to prime minister and, for most posters, another will also feature that party's top candidate in that specific electoral district. Although there is no rule that establishes this, all parties place the different designs sequentially on the spots allocated. Since all banner segments have at least twenty banner spots, all voters that are exposed to ads from a given party see all the different banner designs.

With respect to posters, parties also have a limited number of designs. Since the size of posters is larger than that of banners, some but not all of the posters will contain an additional slogan. Overall, there is no cause for concern that parties might be targeting the content of the ads to the areas they are assigned to. This was further confirmed by contacts with campaign organizers of multiple parties in the city of Barcelona. Furthermore, parties may still choose not to use the

spots that they were assigned to, and do so strategically. It is extremely unusual for parties that have requested to have street level ads to relinquish it after the allocation. [19]

For this analysis, I use the sub-sample of the sections that were exposed to at least one ad. Moreover, I include section fixed effects to control for section-specific characteristics such as the area of the section and the number of ads it is exposed to. I also include party-fixed effects in all estimations combining the voting outcomes for more than one party and year fixed-effects when considering the data for the two elections. When it is not possible to include section fixed effects, I include the socio-demographic variables in the regressions as control as well as the total number of ads. If the dependent variable does not take into account the area of influence of the section then I include it as an additional control.

Another plausible concern has to do with the spatial nature of the analysis and the potential correlation that might exist across areas, which may bias the estimates. As can be seen in Figure A.20 and Figure A.21, 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). Most segments follow the borders of the census sections — since the layout of the sections follows the streets of Barcelona — or crosses two or more sections. This means that sections that are nearby are likely to, at least partially, be exposed to the same ads. Hence, there could be a bias in the estimates if I do not take into account that nearby sections are likely to vote in a similar way but also be exposed to a similar number and distribution of ads.

In order to account for spatial correlation, I estimate Conley standard errors (Conley 1999) as well as heteroskedasticity-robust standard errors in all regressions.[20]

Finally, even though the randomization of the allocation of parties to pre-designated ad spots is what allows me to identify the effect of ads, it could be that the results that I obtain are very sensitive to that particular draw of the distribution, especially given the correlation of vote shares across space mentioned above. I use the randomization device used in the allocation to simulate

[19] Sometimes small parties who choose not to fill in *any* of the spots allocated to them because the production and distribution costs are too high. The November 2019 general elections constituted an exceptional case where all parties signed an agreement to not use any street-level advertising in order to cut down costs, since this was a repeat election and the fourth general election in four years.

[20] Results are also robust to clustering the error terms by sections.

other potential distribution of the ad locations across parties to use as a robustness check in the main results of this paper. To do that I construct a new dataset that relates each section to an ID variable that uniquely identifies an ad — that is, a poster or a banner segment. In the case of a banner segment, I also add the exact number of banners within that segment to which that section is exposed to using the 500m buffer. Then, since the number of posters and banner segments assigned to each party is known, I generate 1000 different random assignments of the parties' ads to the available locations. Using both the new dataset and the random assignments, I compute, for each permutation of the treatment, 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 under the permutation assignments and obtain a new bootstrapped p-value by computing the percentage of occurrences where the hypothetical t-test value is above the actual t-test value.

4. Results

4.1. Effects of Party Ads on Vote Shares: Own Party Effects

In this section I present the results regarding the effects of exposure to a party's ads on its vote share. Thus, I start by estimating the following for a given election year:

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

Where $\text{VoteShare}_{i,p}$ refers to the vote share of party p in section i, $\text{AdDensity}_{i,p}$ refers to the number of ads per 100m^2 of party p within the perimeter of influence of section i, π_p denotes party fixed effects and ψ_i denotes section fixed-effects. Furthermore, I also estimate this regression using both elections and add election and party-election fixed effects.[21]

In Table 3, we can see the results of estimating Equation 1 in sections that had at least one ad, for the two elections under consideration, separate — columns (1) to (4) and combined — columns (5) and (6). In all cases, ad density has a positive and significant effect on vote shares, with the size of the effect going from a 0.719 to a 1.158 point increase in a party's vote share. This means that, on average, an increase of one ad per 100m^2 increases a party's vote share by 1.16 percentage points. This positive effect is statistically significant at the 5% or 1% when considering perimeters the different perimeters of influence as shown in Table A.17 to Table A.19 in Appendix E. Overall, it

[21] I also estimated this model with a quadratic term for add density, but that term was not statistically significant in any specification.

Table 3. **Effects of Own Ad Density on Vote Shares**

	Vote Shares		
	2016	2019	2016–2019
	(1)	(2)	(3)
Ad Density	0.843**	1.158***	0.953***
	(0.137)	(0.165)	(0.134)
	[0.360]	[0.193]	[0.187]
Observations	5550	8802	14472
R^2	0.63	0.79	0.73
Fixed Effects	Yes	Yes	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 use the 500m perimeter of influence. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

seems that ads were less effective in 2016 than in 2019. A reasonable explanation as to why this may be the case is that there had been another general election seven months prior, dampening the effect of a new set of ads in the 2016 elections. Moreover, when bootstrapping the p-value the results are 0.025 for the combined two years, 0.288 for 2016, and 0.025 for 2019.

The results are also robust to using raw vote shares – number of votes for a party divided by the electorate – as can bee seen in Table A.22. This suggests that increasing the ad density of parties' ads not only increases its relative vote share but also the number of voters that voted for that party.

The results presented indicate that electoral ads do indeed matter and have indeed a positive effect on a party's success in the voting booth. But the question still remains as to what is the overall effect of ads across the city. In order to do that I estimated Equation 1 but using number of ads of a given party instead of ad density — the results can be found in Table A.20 and Table A.21 in Appendix E. The estimated coefficient in the first column can be interpreted as one additional ad in a given section increases by 0.005 the vote share of that party in 2016 and by 0.009 in 2019. If there were a one standard deviation increase in the total number of ads and those were assigned to

Table 4. **Effects of changes in Ad Shares on Single-Party Ad sections (2016–2019)**

	Vote Shares	
	(1)	(2)
Ad Share	3.578***	3.524***
	(0.795)	(0.796)
	[0.812]	[0.791]
Observations	708	708
R^2	0.68	0.68
Spatial Lag	No	Yes
Fixed Effects	Yes	Yes

Notes: Ad Share refers to the share of ads of a party in a given section. Fixed effects for party, year, and party-year are included in all regressions. Section, year, and party fixed-effects are included. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$.

a given party, that party's vote share would on average increase by 0.61 and and 0.96 percentage points, in 2016 and 2019 respectively.[22]

I also consider areas that are only exposed to ads of one party. In this set-up, a treatment is to be exposed to ads of a given party versus being exposed to ads of any other party. Furthermore, I also take out observations that were only exposed to one single ad. In particular, I estimate the following specification:

$$\text{VoteShare}_{i,p,t} = \beta\, \text{AdShare}_{i,p,t} + \lambda_{t,p} + \psi_i + \varepsilon_{i,p} \tag{2}$$

Where $\text{AdShare}_{i,p,t}$ is the share of ads of party p in section i at time t and $\lambda_{t,p}$ denotes party-year fixed effects. Since we are only considering sections that were exposed to ads by a single party, $\text{AdShare}_{i,p,t}$ is either equal to 0 or to 1. Finally, I also only consider parties for which there was at least one section that was exposed to ads of that party alone.

The results of the specification in Equation 2, where I only consider sections that were exposed to ads of a single party. In particular, the effect of a section being exposed to ads of a single party increases that party's vote share by around 3.5 percentage points.

[22]These numbers have been weighted by the fact that the population exposed to ads represents 90% of the city's population.

Table 5. **Left-Right location of parties running in the 2016 elections in Barcelona**

Party	Avg. Location	SD. Location	N
CDC	6.66	1.81	680
Cs	7.28	1.79	717
ECP	2.71	1.29	657
ERC	3.24	1.66	691
PP	8.94	1.23	760
PSC	5.19	1.62	753
Sample	3.93	1.80	737

Note: Parties are located between 1 and 10, where 1 means left-wing and 10 means right-wing.

4.2. Effects of Party Ads on Vote Shares: Cross-Party Effects

As was shown in the previous section, party's own ads positively affect their vote share in the election. However, a party's ads are not isolated and voters might see them together with ads of other competing parties. This could affect the party's vote share and depend on whether the other parties' are close or distant from in the ideological spectrum.

In order to measure whether two parties are close, I use the survey data from the 2016 and 2019 Pre-electoral and Post-electoral surveys run by the Centro de Investigaciones Sociológicas (CIS). These surveys were carried out throughout the two weeks prior to the start of the campaign and in the weeks following the elections, respectively. Respondents were selected through stratified random sampling to be a representative of all the electoral districts in Spain. I only use the sub-sample of respondents that live in the district of Barcelona, which has over 600 respondents in both years. 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.[23] Table 5 shows the average location of the six main parties, the standard deviation, and the number of respondents in the 2016 survey – see Table A.11 for 2019's average location of the parties. According to the respondent's assessment, parties seem to be spread out throughout the left-right spectrum, with two parties close to 1 (left) and 10 (right): ECP and PP. Similarly, two parties occupy the center of the ideological spectrum: CDC and PSC.

[23]Usually, only parties represented in parliament are considered. Exceptions are made when the political party is expected to gain representation in the upcoming.

Using the survey data I categorize parties as being close or far from one another. In particular, party q is close to party p if party q's average ideological position is no more than 3 points away from party p's. Otherwise, party q is far from party p. 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.

Hence, I can use these indicators to create two variables relating to the ad density of close and distant parties.

$$\text{VoteShare}_{i,p} = \beta \text{AdDensClose}_{i,p} + \pi_p + \psi_i + \varepsilon_{i,p} \tag{3}$$

$$\text{VoteShare}_{i,p} = \beta \text{AdDensDistant}_{i,p} + \pi_p + \psi_i + \varepsilon_{i,p} \tag{4}$$

where $\text{AdDensityClose}_{i,p}$ refers to the number of ads per 100m^2 of party p's close parties and $\text{AdDensityDistant}_{i,p}$ to the number of ads per 100m^2 of party p's distant parties.

As much as the left-right divide is a useful and meaningful way to locate party's platforms, usually there is more than one policy dimension that is relevant to understand the party's platform. Hence, I also use the parties' location in their perceived stance of the territorial organization of Spain, which has been a topic of notable relevance in the recent past. The Tables with the location of the parties in this dimension can be found in Appendix B in A.12. [24] I classify the parties in the same groups as before — close or distant — and estimate the same regression above.[25]

Table 6 presents the results of estimating Equation 3 and Equation 4 as well as the own Ad density for comparison — the results of the estimation by year can be found in Table A.27 and Table A.28. Only the coefficient on the ad density of close parties is statistically significant and negative, but also around half of the effect of own party ads. That is, being exposed to ads of parties that are ideologically close to a given party has a negative effect on that party's vote share or, in a nutshell, ads of close parties act as substitutes.

When considering only a specific year, the effects of other parties' ads changes. In 2016, both ads of close and distant parties have a statistically significant effect on a party's vote share. That is,

[24] 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 in this particular scale. For 2019, I assume that VOX is more extreme in its views that the party with the most extreme position I do have data for in the regionalism scale, PP, and impute it 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 competences. This is a stance that is not shared by any other party represented in the Spanish parliament.

[25] When grouping the parties using both dimensions, I classify them as close if they are not more than 4 points away.

Table 6. **Effects of Own and Other Parties' Ad Density on Vote Shares (2016–2019)**

	Vote Shares				
	(1)	(2)	(3)	(4)	(5)
Ad Density	1.001***	—	—	0.963***	0.846***
	(0.148)			(0.153)	(0.164)
	[0.205]			[0.242]	[0.149]
Ad Density	—	-0.357***	—	-0.133	—
Close Parties		(0.127)		(0.132)	
		[0.117]		[0.156]	
Ad Density	—	—	-0.531***	–	-0.303**
Distant Parties			(0.110)		(0.121)
			[0.174]		[0.148]
Observations	10593	10593	10593	10593	10593
R^2	0.53	0.52	0.53	0.53	0.53
Moran's I	0.00	-0.00	0.00	-0.00	-0.00
Fixed Effects	Yes	Yes	Yes	Yes	Yes
Spatial Lag	No	No	No	No	No

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 3 points away from party p in the 1-10 left-right ideological scale. Ad density Distant parties refers to the number of ads of parties that are over 3 points away from party p in the 1-10 left-right ideological scale. There are year, section, and party fixed effects. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

ads of close parties are actually beneficial to a party's vote shares whereas ads of distant parties are detrimental. This is robust to group parties as either close or distant using the left-right dimension or when combined with the regionalism dimension — see Table A.29. This suggests that in this election, voters may have been engaged in coalition-type thinking, where close parties are not seen as close competitors but as likely to form alliances in the coming term. Therefore, an increase of banners from parties that are similar to a voter's preferred party might encourage the feeling that this is a group of parties that could do well in the elections and hence have a shot at leading policy initiatives and passing laws once they are elected.

On the other hand, it seems to be the case that the results from Table A.19 were driven by the 2019 elections, since we see that in that year ads of close parties indeed had a negative and statistically significant effect on a party's vote share — the results are available in Table A.28. It should also be noted that, again, although they have opposed signs, the magnitude of the effect of the ads of close parties is, in both years, around 0.87. However, when considering both dimensions both close and distant parties now have a statistically significant negative effect on a parties vote share — see Table A.30. The size of the effect is also smaller, which is likely to be partly due to the fact that the set of parties deemed close decreases significantly when including the second dimension, as seen in Table A.13.

There are two possible reasons why the effect of other parties' ads changes across the years. First is that the content of the ads has changed. There are new slogans and different candidates, potentially changing the interaction across parties. However, given the generic nature of parties' slogans and the little information they contain, it's more likely that they explain the heterogeneity found in the effects of a party's ads on it's own vote share than the changes in cross-party effects. The second, and most likely explanation, for this phenomenon is that the political context, which influences the overall campaign strategy and message of political parties, has changed. In order to explore this possibility, I next consider the possible heterogeneity in the effects of ads across parties and across different types of parties.

4.3. Heterogeneous Effects of Ads

Additionally to the results presented above, I further explore the effects of ads by considering the effects across different socio-demographic areas in the city, by party types — e.g. left or right-wing parties — and at the party level.

Using the socio-demographic variables available, I construct two binary indicators with respect to the to income and household age. The first indicates whether a section's average household income is above or below the median income for treated sections. The second indicates whether a section's average household age is above or below the median household age for treated sections. Moreover, I also use geocoded data on the location of all ground level shops in Barcelona for 2016 and 2019. Indeed, the effect of electoral advertising might vary depending on whether neighbours of a given area do have amenities nearby and can walk to most of them or whether they need to take the car or public transportation. I use the number of ground level shop per 100 square meters as a measure of density of amenities – see Figure A.22 in the Appendix. I also create an additional measure with only shops that neighbors would find useful – i.e. I exclude wholesale shops or souvenir shops. As a regressor, I use a binary variable equal to 1 if that particular area and its buffer have a density below the 20th percentile of the city's distribution – see Figure A.23 in the Appendix. I interact both terms with Ad Density and add them as an additional regressors to Equation 1:

$$\text{VoteShare}_{i,p} = \beta_1 \text{AdDensity}_{i,p} + \beta_2 \text{HighIncome}_i \times \text{AdDensity}_{i,p} + \beta_3 \text{HighIncome}_i + \pi_p + \varepsilon_{i,p}$$

$$\text{VoteShare}_{i,p} = \beta_1 \text{AdDensity}_{i,p} + \beta_2 \text{HighAge}_i \times \text{AdDensity}_{i,p} + \beta_3 \text{HighAge}_i + \pi_p + \varepsilon_{i,p}$$

$$\text{VoteShare}_{i,p} = \beta_1 \text{AdDensity}_{i,p} + \beta_2 \text{LowDensity}_i \times \text{AdDensity}_{i,p} + \beta_3 \text{LowDensity}_i + \pi_p + \varepsilon_{i,p}$$

As can bee seen in Table 7, ad density is relatively less effective in increasing a party's vote share in areas with a higher income and in areas with a relatively older population. This holds for both years separately — see Table A.38 and Table A.44 in Appendix E — and when using different variables to measure differences in income such as the percentage of the population within a section with a household income below a given percentage of the median income. The interaction between ad density and shop density is not significant either on its own or when regressed with the other variables. The first result was also found in Larreguy et al. (2018), where they find that ads are more effective in poorer areas, albeit in the context of a developing country. An interpretation for this result would be that wealth is strongly it's correlated with education, and people with higher levels of education face lower costs of obtaining information, and hence would be less influenced by campaign ads. As for the negative effect of the interaction between ad density and household age, this could either indicate that relatively older households are more acquainted with the political parties or more entrenched in their political positions, and hence would be less likely to be influenced by ads. Another possibility is that relatively older households

would also be less likely to leave their domiciles as often as younger households, and hence would be less exposed to street-level ads.

Then, I estimate the regressions (1) to (4) at the party level to check for potential heterogeneity of effects across the different parties with street-level electoral ads — see Table A.23 and Table A.24 in the Appendix. In this case it is not possible to add section fixed effects, so I include fixed effects at the next smallest administrative denomination, city districts. Furthermore, besides including the total number of ads to which each area was exposed, I also include the number of randomization units (posters and banner segments) as an additional control. For instance,

$$\text{VoteShare}_{i,p} = \beta\ \text{AdDensity}_{i,p} + \mathbf{X}_i'\gamma + \sum_{j \neq i} w_{i,j}\text{VoteShare}_{j,p} + \nu_i + \varepsilon_{i,p} \qquad \forall p \tag{5}$$

$$\text{VoteShare}_{i,p} = \beta\ \text{AdDensClose}_{i,p} + \mathbf{X}_i'\gamma + \sum_{j \neq i} w_{i,j}\text{VoteShare}_{j,p} + \nu_i + \varepsilon_{i,p} \qquad \forall p \tag{6}$$

Where ν_i are city-district fixed effects and $\mathbf{X}$ are a set of section-specific controls. These include the total number of ads within the perimeter of influence of the section,the number of randomization units, average household income, percentage of the population with an income by consumption unit below 40% of the median income, average percentage of income coming from pension, average age, and average household size for 2016 are added as controls.

The results of the estimation reveal that there is a large variance in the effects of ads across different parties. In particular, not only is it the case that the magnitude of the effect of ads varies across parties but it is also the case that ads have a positive effect on all parties' vote shares. Focusing on parties which ads have a positive effect on their vote share, the size of the effect of the number of ads per $100m^2$ ranges from 0.591 to 2.352.

At the individual party level, the effects of a one standard deviation increase in the number of ads range from a decrease in vote share of -0.95 percentage points to an increase in 2.45 percentage points — see estimates of the effects of ads at the party level in Table A.36 and Table A.37. Given that in this multi-party system there is no party exceeds the 27% of vote share and many parties have between 10% and 15% of the vote share, an increase or decrease of 1 or 2 percentage points is considerable.

A possible explanation to why ads are detrimental to some parties is that there are striking differences in the ads of different parties and that affects voters. As discussed in Section A, ads across parties share almost identical features in terms of the type of information contained in them — banners used in both elections can be found in Figures A.2 and A.3. It could still be the case

Table 7. **Ad Density and Heterogeneous Effects of Section Characteristics (2016–2019)**

	Vote Shares			
	(1)	(2)	(3)	
Ad Density	1.835***	1.889***	0.907***	2.660***
	(0.204)	(0.289)	(0.157)	(0.324)
	[0.259]	[0.318]	[0.230]	[0.383]
Ad Density × High Income	-1.931***	—	—	-1.886***
	(0.325)			(0.284)
	[0.346]			[0.344]
Ad Density × High Age	—	-1.270***	—	-1.180***
		(0.324)		(0.324)
		[0.345]		[0.395]
Ad Density × Low Density	—	—	0.416	-0.091
			(0.391)	(0.394)
			[0.435]	[0.435]
Observations	10593	10593	10593	10593
R^2	0.53	0.53	0.53	0.53
Moran's I	-0.00	0.00	0.00	0.00
Spatial Lag	No	No	No	No
Fixed Effects	Yes	Yes	Yes	Yes

Notes: Ad density refers to the number of ads per $100m^2$ of party p in section i. Ad density × High 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 × High 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. Heteroskedasticity-robust standard errors are shown in parentheses and Conley standard errors are reported in brackets. There are year, party, and section fixed effects. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

that a particular slogan proved to be successful among voters or that a candidate featured in the banners was broadly disliked by the electorate. Underlying this discussion is the question as to how street-level ads may appeal to voters' sensibilities. Because of the few pieces of information contained in a banner, these also become extremely salient. Discarding the name of the party, which would be at most indicative for established parties, the slogan of the campaign and the face of the candidate are by far its most prominent features.

There is a wide body of literature devoted to study the effect of a candidate's appearance and on voting behavior. There is suggestive evidence that physical attributes of a candidate — attractiveness, smile, gender, and even skin color — have not only an effect on voters' perception on the candidate's competence but also in their likelihood of voting for that candidate-party (Alexander and Andersen 1993; Schubert et al. 2011; Horiuchi et al. 2012) even after controlling for other non-visual candidate characteristics (Berggren et al. 2010). Not only that, but quick judgements based on a candidate's appearance are a good predictor of an election's outcome (Ballew and Todorov 2007). Different physical attributes have also been linked to different neural activity (Spezio et al. 2008). Moreover, research suggests that parties are aware of the effects that a candidate's appearance has and that challenger parties tend to present candidates with candidates with better facial attributes (Todorov et al. 2005; Atkinson et al. 2009; Olivola and Todorov 2010).

On the other hand, although much attention has been put on the linguistics of slogans and their capacity to draw an emotional response from voters, there is little research that has been conducted as to how a slogan has an effect on voters' perception of a candidate or on their voting intention. The existing research does indicate that slogans have an effect on candidate perception (Mendoza and DiMaria 2019). Hence, evidence on how voters react to candidates and, to a lesser extent, slogans, suggests that street-level ads most likely have an effect through the visual representation of the party's candidate. Therefore, which candidate is featured in the party's ads could have a negative as well as a positive effect on the electorate.

To check whether there are any patterns across different types of parties I group them as left-wing and right-wing, or as old and new parties.[26] Then I estimate Equation 1 only considering one group of parties. From Table A.40 and Table A.41, I infer that for left-wing parties, ads of any other party have a detrimental effect on its vote share. This is not the case for right-wing parties, which either are unaffected by other parties' ads (2019) or benefit from them (2016).

[26]In particular, ECP, ERC, and PSC are considered left wing parties and CDC, Cs, PP, and VOX are considered right-wing parties. Only Cs, ECP, and VOX are considered as new parties.

When it comes to older and newer parties, the effects vary greatly across the two elections — see Table A.42 and Table A.43. In 2016, the ads of distant parties have a negative effect on both new and old parties, in line with the results in Section 4.2, and in one of the two specifications old parties are benefited by the ads of close parties. In 2019, the negative effect of close parties' ads is only present for old parties, whereas new parties seem to actually benefit from the ads of closer parties. Additionally, I also conducted a similar analysis focusing on two different groups of parties, centrists and extremist parties.[27] No clear patterns emerge but the results can be found in Table A.45 and Table A.46 in Appendix E.

With this in mind, let us now consider the results presented in the previous section, where the effect of close parties' ads was positive in 2016 but negative in 2019. In 2016, elections were called as a result of the failure of parties in parliament to form a government. However, the polls confirmed that the next government would need to secure the support of at least one other major party in the national parliament. Throughout that campaign, parties insisted on the need to form a stable government, which would inevitably have to rely on the cooperation across multiple parties. This was particularly the case for right and center-right parties[28], but it wasn't always the case for left-wing parties. Indeed, polls before and during the campaign suggested that the new coalition of left-wing parties, including Unidas Podemos[29], would increase its vote share considerably and could even overtake the other center-left party, PSOE. This led Podemos to adopt a more competitive stance against PSOE, since it appeared that it was possible to surpass them in number of votes[30]

On the other hand, in 2019 the elections were called by the government — at that point, in the hands of PSOE — after they failed to secure enough parliamentary supports to pass the State's budget. Their goal was clearly to increase their electoral support in order to not depend on other parties. The strategy of Unidas Podemos and their allies was to argue that they were the only guarantee of a left-wing government that would actually pass left-wing policies — as opposed to

[27]Using both ideological dimensions, I classify parties as extremists if there are within 2.5 radius from any of the four corners of the ideological space.

[28]For instance, PP — which has Cs and PSOE as the closest parties — on the one hand saw very favorably having the support from Cs and also brought forward the idea of a "great coalition" between PP and PSOE. Similarly Cs made it clear that they were ready to negotiate with any party except Unidas Podemos and the other parties it was affiliated with (El Confidencial, 06/14/2016; Libertad Digital, 06/15/2016).

[29]In 2016 and 2019, Podemos ran in an electoral coalition with Izquierda Unida(IU) — besides its more traditional regional allies such as ECP in Catalonia or Compromís in València — and that coalition was named Unidos Podemos in 2016 and Unidas Podemos in 2019.

[30]El País (06/06/2016), El Mundo (06/09/2016), El Periódico (06/13/2016), El Español (06/20/2016).

a solo goverment of PSOE.[31]. Moreover, both distanced themselves from the other left-wing party that is very prominent in Catalonia, ERC, due to its stance on the territorial organization of Spain. On the other hand, right-wing parties were facing the rise of VOX — an far-right party — that was predicted by the polls to obtain representation in these elections. The other two right-wing parties reacted to this by shifting their platforms closer to that of VOX's and hence, making it more likely to be perceived as substitutes of each other.[32]

5. Conclusion

In this paper I analyze the effects of electoral advertising on voting behavior by studying the randomized allocation of the street-level ads of political parties in the city of Barcelona in the general elections of 2016 and 2019. This is a multi-party system where 7 to 9 parties have electoral ads and, thus, a heavily competitive advertisement. Hence, I estimate the effect that a party's own ads has on its vote share as well as the effects of ads of the other parties, which I group by how ideologically similar they are.

I find that a party's own ads have a positive effect on its vote share, with the results being rather heterogeneous at the party level. On the other hand, the results on cross-party effects are more nuanced. In 2016, results show that ads of parties that are close act as complements of a party's own ads, that is they have a positive effect on a party's vote share. Conversely, ads of parties that are distant have a negative effect on a party's vote share. This is not the case in 2019, where both ideologically close and ideologically distant parties have a negative effect on a parties' vote share. One possible explanation that I offer to understand this phenomenon, is some anecdotal evidence on the changes in campaign strategies between elections.

Indeed, the most logical explanation as to why some of the parties see their ads have a negative effect on their own vote share in one election resides in the candidate's characteristics, it is more likely that the changes in the cross-party effects reflects also a change in the political situation. After all, changes in political alliances and political discourse are a constant in politics and they permeate electoral campaigns as well as the voters' perception. Indeed, I argue that this is due to the broader campaigns that parties led, which might have changed whether voters engaged in a coalition-type thinking or not. This opens more avenues of research which branches with issue-selection by political parties. Indeed, in this paper I consider two different two different

[31] El Mundo (04/26/2019), ABC (04/23/2019)
[32] France 24 (04/26/2019), El Plural (04/17/2019), Foreign Policy (04/23/2019).

policy dimensions — left versus right, centralism versus regionalism — and the combination of both. However, I cannot observe or measure whether parties decided to make one of the two more salient throughout the campaign, as well as framing potential alliances in either dimension, or whether voters are more responsive to either one of these dimensions.

References

Alexander, D. and K. Andersen (1993). Gender as a Factor in the Attribution of Leadership Traits. *Political Research Quarterly 46*(3), 527–545.

Atkinson, M. D., R. D. Enos, and S. J. Hill (2009). Candidate Faces and Election Outcomes: Is the Face-Vote Correlation Caused by Candidate Selection? *Quarterly Journal of Political Science 4*(3), 229–249.

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*(46), 17948–17953.

Berggren, N., H. Jordahl, and P. Poutvaara (2010). The looks of a winner: Beauty and electoral success. *Journal of Public Economics 94*(1-2), 8–15.

Brader, T. (2005). Striking a Responsive Chord: How Political Ads Motivate and Persuade Voters by Appealing to Emotions. *American Journal of Political Science 49*(2), 388–405.

Bruell, A. (2019, June 9). Political ad spending will approach $10 billion in 2020, new forecast predicts. *The Wall Street Journal*. https://www.wsj.com/articles/political-ad-spending-will-approach-10-billion-in-2020-new-forecast-predicts-11559642400 .

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

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

Da Silveira, B. S. and J. M. P. De Mello (2011). Campaign Advertising and Election Outcomes: Quasi-natural Experiment Evidence from Gubernatorial Elections in Brazil. *The Review of Economic Studies 78*(2), 590–612.

Dommett, K. (2020, October 20). The system of electoral regulation remains ill-equipped for the digital age – action is needed from government, regulators, companies and civil society. *LSE British Politics and Policy*. https://blogs.lse.ac.uk/politicsandpolicy/multi-layered-electoral-regulation-reform. .

Federal Communications Commision (2017). Significantly Viewed List. Technical report.

Freedman, P., M. Franz, and K. Goldstein (2004). Campaign Advertising and Democratic Citizenship. *American Journal of Political Science 48*(4), 723–741.

Galasso, V., T. Nannicini, and S. Nunnari (2020). Positive Spillovers from Negative Campaigning. *American Journal of Political Science*.

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*(1), 135–150.

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

Horiuchi, Y., T. Komatsu, and F. Nakaya (2012). Should Candidates Smile to Win Elections? An Application of Automated Face Recognition Technology. *Political Psychology 33*(6), 925–933.

Huber, G. and K. Arceneaux (2007). Identifying the Persuasive Effects of Presidential Advertising. *American Journal of Political Science 51*(4), 957–977.

Jaursch, J. (2020, June 16). How to write rules for fair digital campaigning. *Brookings*. https://www.brookings.edu/techstream/how-to-write-rules-for-fair-digital-campaigning .

Kendall, C., T. Nannicini, and F. Trebbi (2015). How Do Voters Respond to Information? Evidence from a Randomized Campaign. *American Economic Review 105*(1), 322–353.

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*(1), 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*(6), 1812–1849.

Mendoza, S. A. and M. G. DiMaria (2019). Not "With Her": How Gendered Political Slogans Affect ConservativeWomen's Perceptions of Female Leaders. *Sex Roles 80*, 1–10.

Olivola, C. Y. and A. Todorov (2010). Elected in 100 milliseconds: Appearance-Based Trait Inferences and Voting. *Journal of Nonverbal Behavior 34*, 83–110.

Parker, G. (2020, June 3). British political advertising must be regulated. how to do it is a harder question. *The Guardian*. https://www.theguardian.com/commentisfree/2020/jun/03/british-political-advertising-regulated-parties-support. .

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*(1), 33–49.

Spenkuch, J. L. and D. Toniatti (2018). Political Advertising and Election Results. *The Quarterly Journal of Economics 133*(4), 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*(4), 344–352.

Todorov, A., A. N. Mandisodza, A. Goren, and C. C. Hall (2005). Inferences of Competence from Faces Predict Election Outcomes. *Science 308*(5728), 1623–1626.

Tribunal de Cuentas (2016). Informe de Fiscalización de las contabilitdades de las Elecciones a Cortes Generales de 20 de Diciembre de 2015. Technical report.

Tribunal de Cuentas (2017). Informe de Fiscalización de las contabilitdades de las Elecciones a Cortes Generales de 26 de Junio de 2016. Technical report.

Appendix

A. Electoral System and Advertising in Spain

As mentioned in Section 1, legislative elections in Spain follow a system of proportional representation across multiple districts where MPs are assigned at the district level and following the D'Hondt method. This method is perhaps the most common across democracies with a proportional representation system. This system works in rounds, where in each round a seat is allocated to a single party out of the total number of seats that district has. In particular, at a given round r, the vote share of each party p is divided by $s+1$, where s is the number of seats that party has been allocated to so far, i.e. $q = \frac{\text{VoteShare}_p}{s+1}$. The party with the highest q gets assigned the seat in that round.

All electoral processes are overseen by the Junta Electoral, the electoral commission. Any possible transgressions of electoral laws are dealt 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[33]. The members of the local commissions remain anonymous. The local comissions are formed a couple of months before election day and dismissed one hundred days after it[34].

Besides regulating street-level advertising, all other forms of political advertising are also regulated by Spanish law. In terms of TV and radio ads, available spaces in state-owned media are made available to parties. Electoral authorities decide the time of the day ads will be shown and the length of the ads cannot exceed 30 seconds. The total number of ads shown during the electoral period is also determined by the results in the previous elections. For the parties that obtained representation in the previous elections, the amount of time allocated ranges from 15 minutes to parties that had less than 5% of the vote shares of the previous election to 45 minutes to parties that obtained at least 20% of the vote shares. Parties that did not run in the previous election or did not obtain representation get 10 minutes throughout the entire campaign. More-

[33]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 an electoral district

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

over, 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[35].

Privately-owned TV may give parties more freedom in terms of the timing of the ads but the number is still determined by their previous electoral results. In any case, parties are offered these spaces for free and cannot purchase additional space. When it comes to mail, parties are able to secure a heavy discount if they choose to send a letter to the entire 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 electiion day.

The banners and posters in the data consist most but not the totality of street level advertising. First, the townhall also puts up some panels across the city where any party — regardless of whether it request space for banners and posters — may put up its ads. This also means that parties can put ads one on top of the others. Second, parties may also put electoral ads in designated areas where anyone is free to put up whatver 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. Moreover, any passerby can freely remove or tear those posters.

Moreover, the amount a party can spend for a given general election is capped at €0.37 per voter within a given electoral district[36]. 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[37].

All parties that obtain at least one MP or senator on that particular election receive a subsidy from the State. The amount of the subsidy is determined by the number of MPs obtained, the number of votes for their lists to the Parliament, and the number of votes for their candidates to the Senate. Overall, parties seem to spend an amount that is equal or not much larger than their subsidy, which is disbursed to parties weeks after the elections. Parties can request up to a 30% advancement over the subsidy they received in the previous comparable election[38]. In order to make up for the rest of the expenses parties usually rely on party funds, private donations,

[35]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 and they can be found in the Ley Orgánica 5/1985, de 19 de Junio, del régimen electoral general, Capítulo VI, Art. 64.4.

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

[37]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.

[38]If it so happens that this advancement is above the party's spending limit the party will have to return the difference to the State.

and credits. Finally, the donation limit for any individual or legal entity to a party, federation, or coalition, is of €10,000 per election.

The incumbent party's actions are particularly regulated by the law in Spain. From the time that elections are called, the government cannot hold any act or institutional campaign that has references to things that have been accomplished by the government or use images or words that are reminiscent of their campaign slogans. Moreover, members of the government cannot participate in the inauguration of any public works or the start of public works.

With some exceptions, the content of electoral ads is quite homogeneous across parties, as can be seen in Figures A.2 and A.3. The standard banner features the picture of the candidate to Prime Minister — which is usually nation-wide —, the name of the party, and a short slogan. Sometimes a second banner would include the picture of the top candidate for that electoral district. Usually the party adopts the same slogan for all electoral districts, allowing for translation into the other official regional languages of Spain.

Census sections are determined by the population registered in the Decennial Census. If people move to a different area, be it within the city or outside of it, then they usually communicate to the townhall their change of residence or register as residents of a different city. The only real concern for the analysis would be the case in which people would be registered as living in a given section but actually lived somewhere else 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 registered at the census section correspond to the voters that voted in person or that requested an absentee ballot. In any case, they do not include the votes of voters who are officially living abroad. If a person living abroad decided not to register at the consulate, she is only able to vote in person or if she was in Spain, requested an absentee ballot, and sent her vote while in Spain. 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.

All elections studied in this paper were called in abnormal circumstances. The 2011 election was called some months early; it was supposed to be held in March 2012 and was instead held in November 2011. The government chose to anticipate the date of the elections in order to prevent further damage to their own vote share giving the rapid deterioration of the economy.

Further evidence of the strategic choice made by the government is the fact that the actual day of the election was November 20th. This is a day of particular significance in Spain since it marks the death of dictator Francisco Franco. The fact that the party in government, which had implemented the first law directly targeting the remains of the fascist regime and the civil war,[39] cannot be taken as coincidental.

The 2016 election was called as a result of a parliamentary deadlock ensuing the December 2015 elections. In particular, there's a deadline by which a government needs to be formed, otherwise new elections will be called. The two most voted parties — PP and PSOE — both independently tried to gather enough support from other parties to form a government but ultimately failed. This was the first time that new elections had to be called because no government was able to be formed with the current parliamentary composition. After the 2016 elections, negotiations were equally challenging and the country was of a brink of a third election in a year. Eventually, PP was able to form a government. In June 2018 and following an important verdict on a high-profile corruption case involving PP, PSOE successfully carried out a motion of no confidence for the first time in the History of Spain and became the party in government. However, the party failed to secure enough supports to pass the yearly budget and was forced to call elections that were held on April 2019.

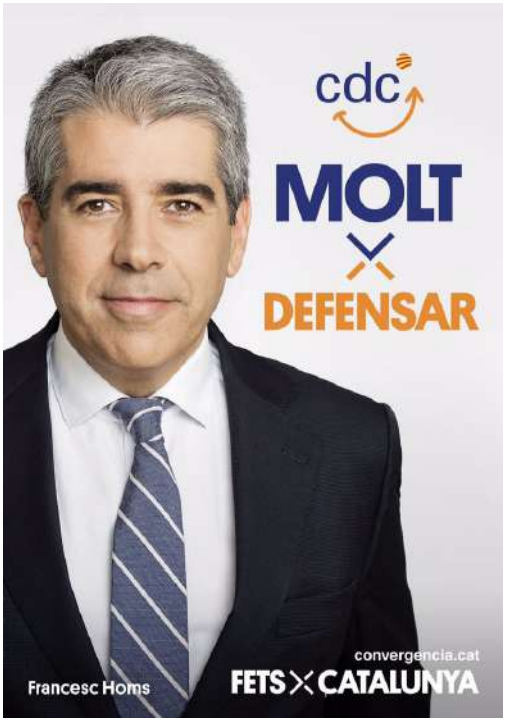
B. Data

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.

The INE Atlas de la Renta includes several income-related variables. In particular, it includes yearly average household and per capita income. Moreover, it also contains 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 indicators of the income distribution of the households within a given census section: percentage of households with a yearly income by consumption unit[40] below €5000, €7000, and €10000. Similarly, it also in-

[39] "Ley 52/2007, de 26 de diciembre, por la que se reconocen y amplían derechos y se establecen medidas en favor de quienes padecieron persecución o violencia durante la guerra civil y la dictadura.", *Boletín Oficial del Estado* núm. 310, de 27/12/2007.

[40] Following the OECD scale, a weight of 1 is given to the first adult in the household, 0.5 for other members that are 14 years old, and 0.3 for children under 14 years old.



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

(b) **Ciutadans (Cs)**

(c) **En Comú Podem (ECP)**

(d) **En Comú Podem (ECP)**

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

(f) **Partit Popular de Catalunya (PP)**

Figure A.2. **Banners and Poster for the 2016 General Elections**

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

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

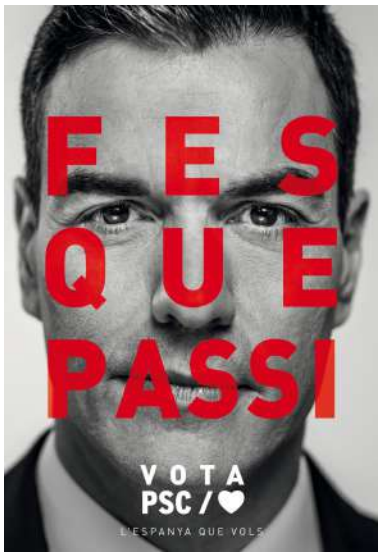
(b) **Ciutadans (Cs)**

(c) **En Comú Podem (ECP)**

(d) **En Comú Podem (ECP)**

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

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



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

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

(i) **Partido Popular (PP)**

Figure A.3. **Banners for the 2019 General Elections**

Table A.8. **Population and Size of Census Sections in Barcelona**

		Mean	Stand. Err.	Min.	Max.	Total
Barcelona	Population (2016)	1475.14	326.91	594	3173	1575453
	Area km^2	0.096	0.545	0.001	14.627	101.4

cludes relative indicators of income distribution of household: the percentage of households with a yearly income below 40%, 50%, 60%, 140%, 160%, and 200% of the median income.

In terms of demographic indicators, the dataset also includes demographic indicators such as population, 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 in Barcelona was obtained directly from the townhall's open data portal. 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 (e.g. restaurants, pharmacies). I exclude any shops that are not listed as active in the year of the election. I exclude the following variables when considering shops that would be most useful to neighbors of any given area: souvenirs, finance and insurance, transportation and storage, real estate, construction, hotels, services for firms and offices, machinery, industrial activities, and Internet cafes. This means that I keep 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.

I also used the Digital Archives at the Universitat Autonoma 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, and otherwise featured "vote [party name]". On average, slogans have 3.5 words, with a minimum of 1 and a maximum of 6.

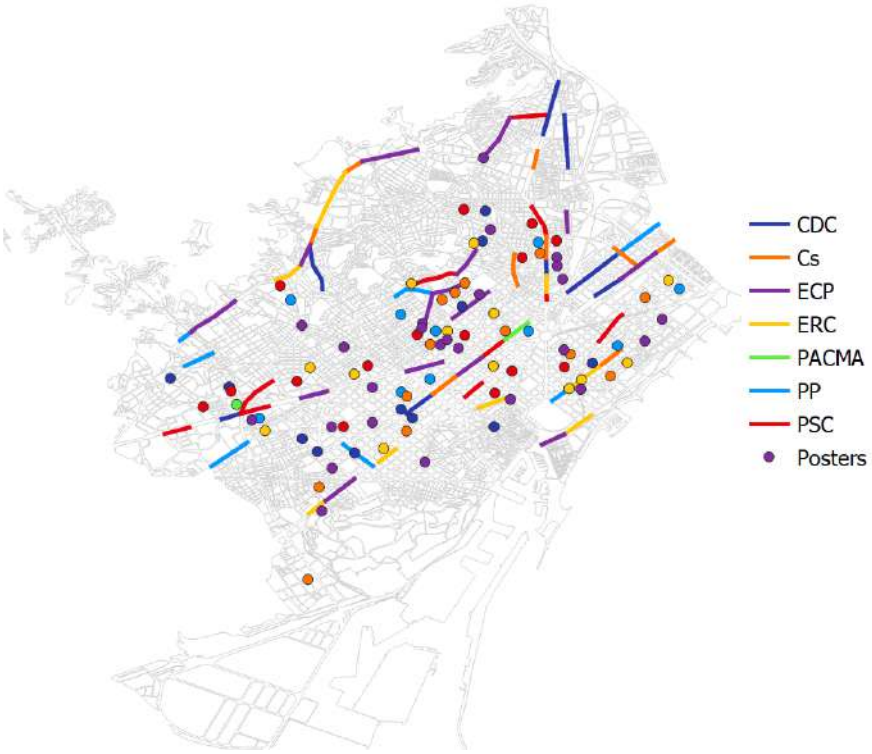


Figure A.4. **Location of Electoral Advertising in the 2016 General Elections in Barcelona**
Notes: The lines denote the segments of streets allocated to different parties, where each party has a different color. Dots denote the posters by each party.

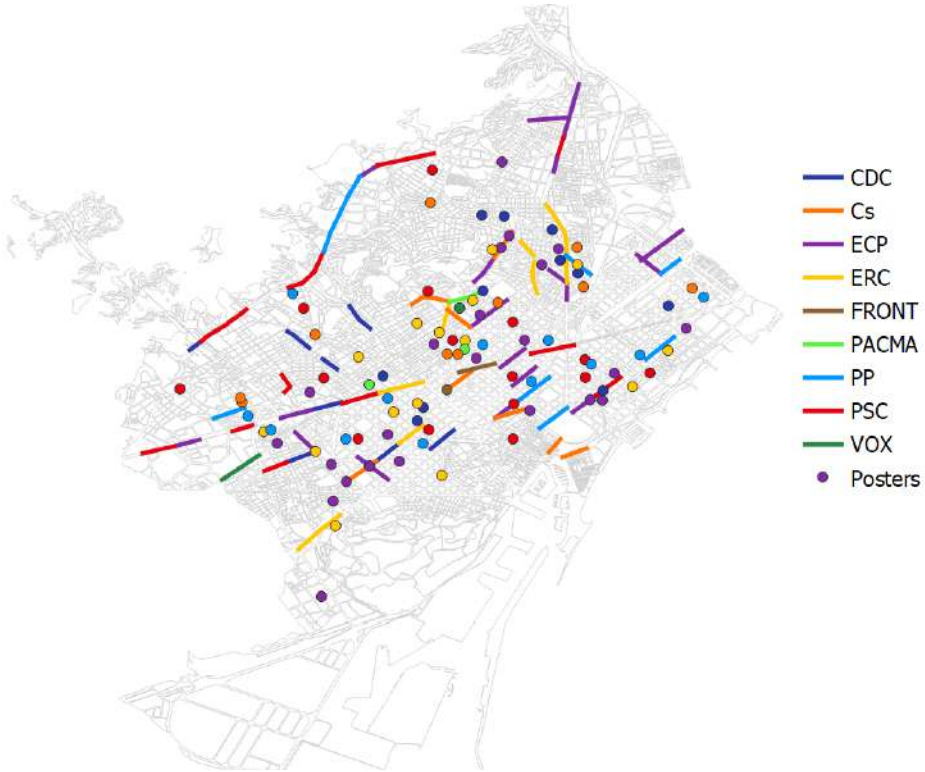


Figure A.5. **Location of Electoral Advertising in the 2019 General Elections in Barcelona**
Notes: The lines denote the segments of streets allocated to different parties, where each party has a different color. Dots denote the posters by each party.

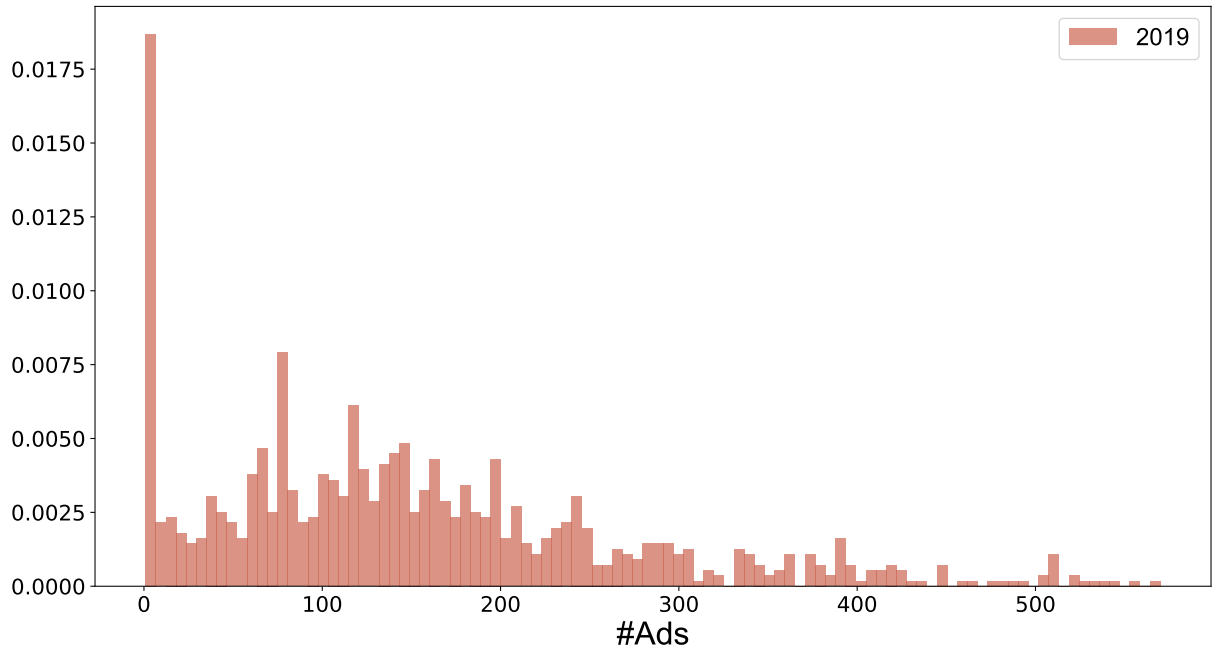


Figure A.6. **Distribution of Ads in Treated Areas (2019)**

C. Empirical Strategy

Location of Banners and Posters

In the case of the posters, their location is given by the 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.

There is little reason to believe that the townhall would strategically choose the spaces available for ads. First, by just looking at the streets chosen to display the ads, it seems that the logic followed was to pick streets that were long, wide enough to host banners, and that are crowded or busy streets. Second, the street segments and posters are spread widely across the city. Third,

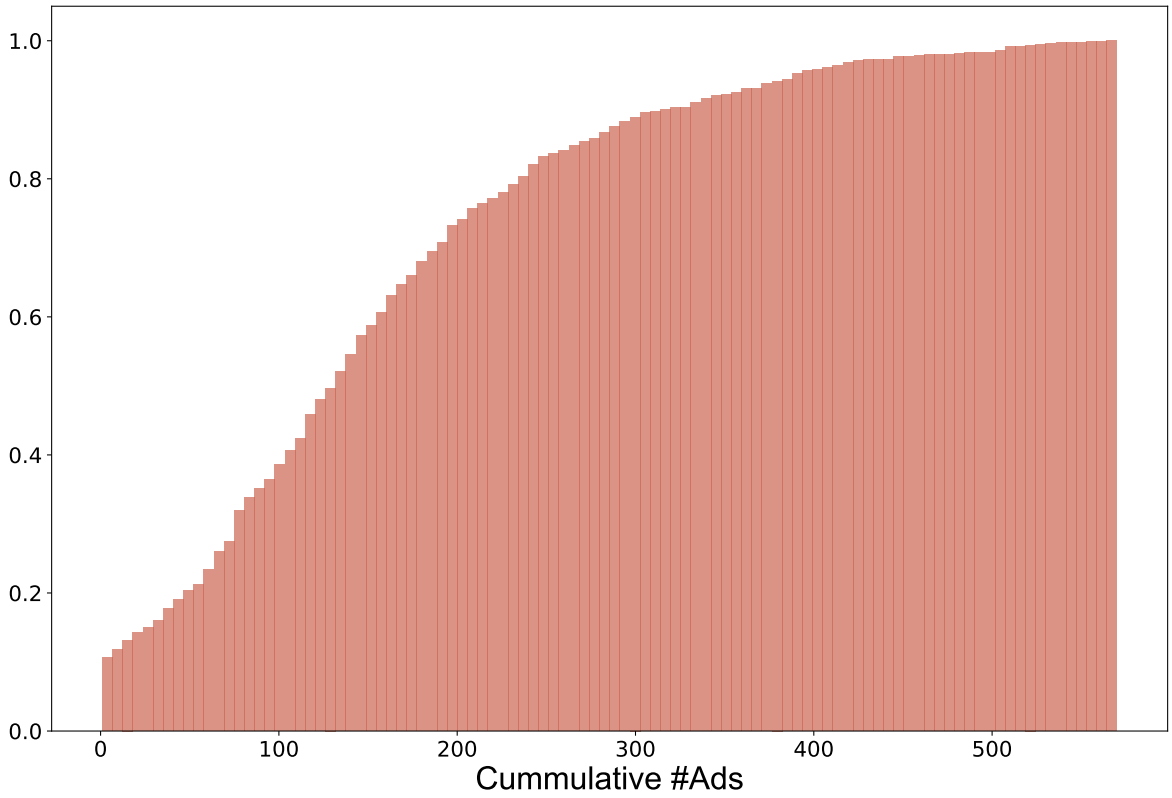
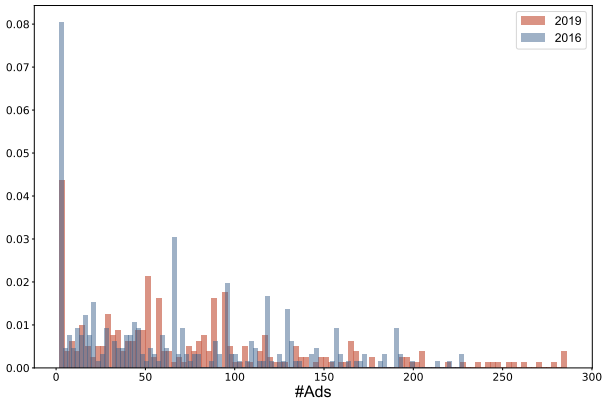
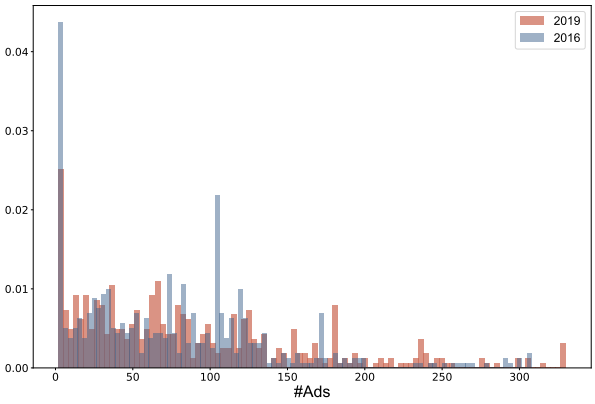


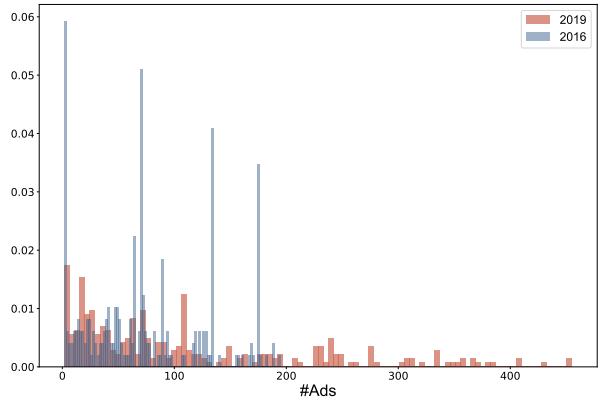
Figure A.7. **Cummulative Distribution of Ads in Treated Areas (2019)**



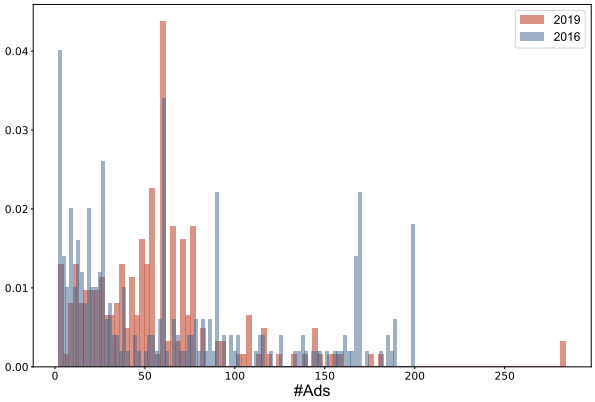
(a) **Distribution of Ads for Cs**



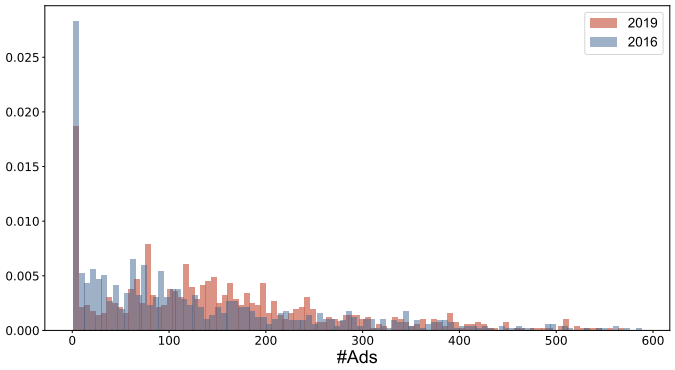
(b) **Distribution of Ads for ECP**



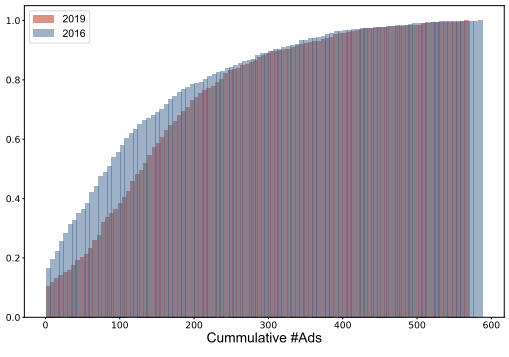
(c) **Distribution of Ads for ERC**



(d) **Distribution of Ads for PP**



(a) **Distribution of Ads**



(b) **Cummulative Distribution of Ads**

Figure A.9. **Distribution of Ads (2016 and 2019**

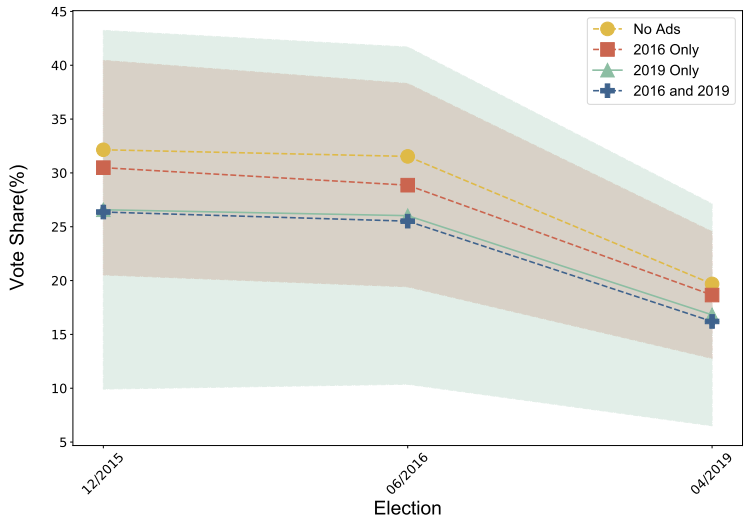


Figure A.10. **Vote Share of ECP (2015–2019)**

even if the townhall would try to choose some of the streets thinking about the governing party's electoral benefit there is no guarantee they would get their preferred locations, since the placement of the ads is randomly allocated. Finally, most of the changes in the street segments observed between 2016 and 2019 correspond to selecting different street segments within the same street. Moreover, I plot the vote share of ECP, the party that governed the townhall from May 2015 onward,– which would be the only party with the ability to select which areas were available for political ads in Figure A.10. 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 standard error bandwidths 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.

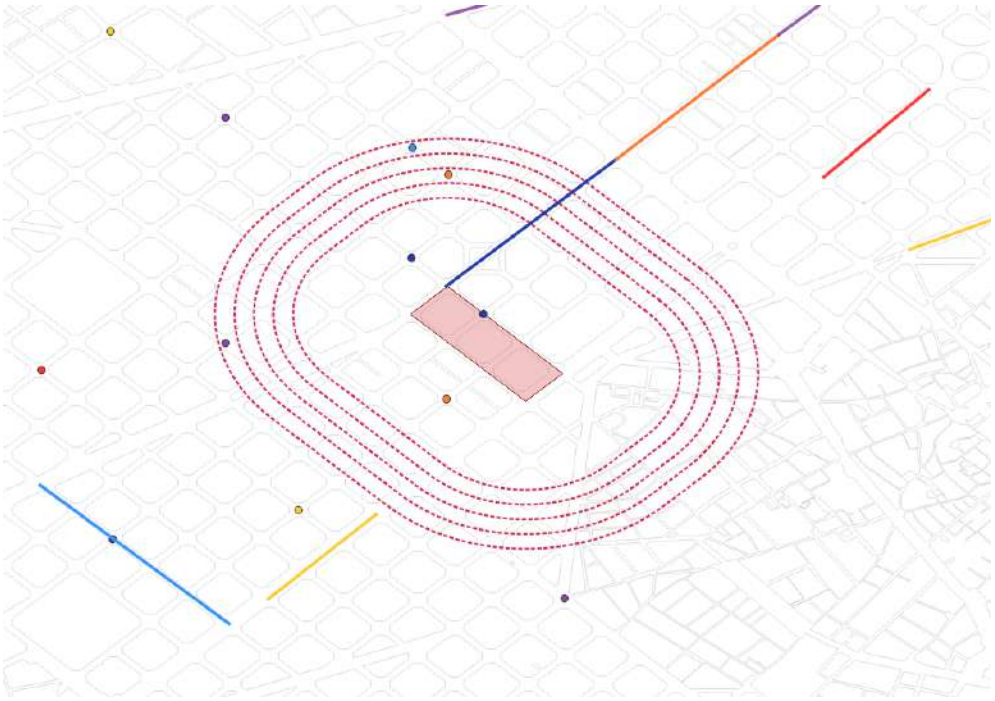


Figure A.11. **Example of perimeters of influence in Barcelona**

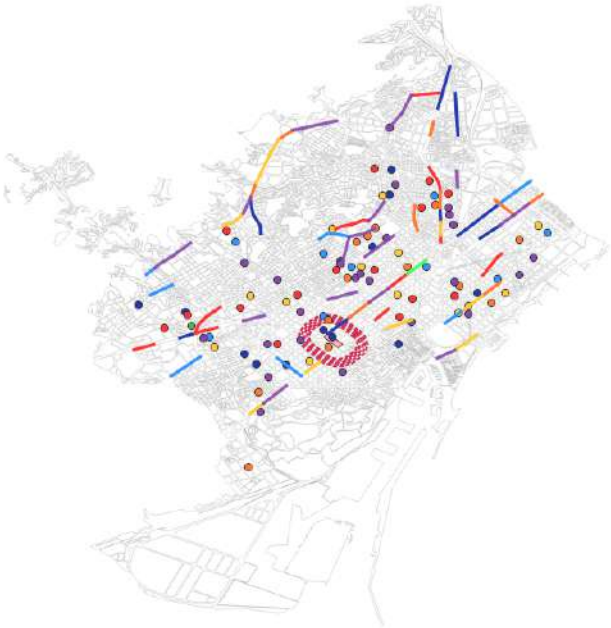


Figure A.12. **Example of perimeters of influence in Barcelona — City overview**

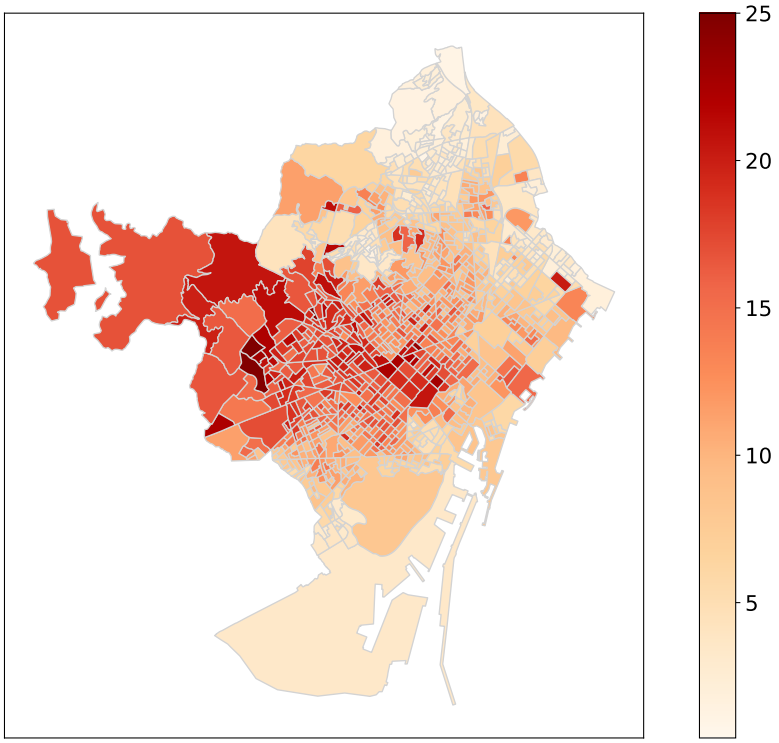


Figure A.13. **Vote Share of CDC by Section (2019)**

		100m	200m	300m	400m	500m
Avg	Treated	39524.84	39082.82	38578.79	38222.34	38039.51
Household	Untreated	37192.79	37173.88	37196.39	37222.25	37236.99
Income	Difference	2332.05***	1908.93**	1382.40	1000.09	802.42
Income	Treated	20.85	21.06	21-16	21.10	21.12
from	Untreated	21.27	26	21.26	21.26	21.26
Pension (%)	Difference	-0.42	-0.20	-0.09	-0.17	-0.14
Avg	Treated	2.39	2.38	2.39	2.39	2.39
Household	Untreated	2.40	2.40	2.40	2.40	2.40
Size	Difference	-0.01	-0.02*	-0.02	-0.01	-0.01

Table A.9. **Socio-Demographic variables in Treated areas above and below the median number of ads**

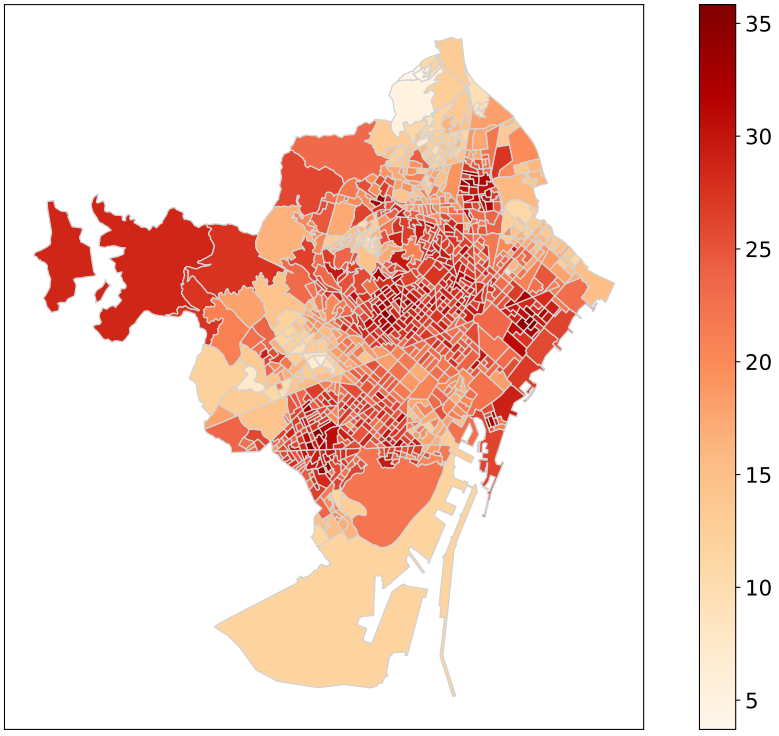


Figure A.14. **Vote Share of ERC by Section (2019)**

Table A.10. **Left-Right location of parties running in the 2016 elections in Spain**

Party	Avg. Location	SD. Location	N
Podemos	2.17	1.41	13571
ERC	3.22	1.79	1558
PSC	4.51	1.64	14402
Cs	6.33	1.40	13353
CDC	6.53	1.91	1518
PP	8.32	1.55	14629
Sample	4.75	2.06	14489

Notes: Parties are located between 1 and 10, where 1 means left-wing and 10 means right-wing. ECP is replaced by Podemos, the nation-wide party it runs with. For the regional parties — CDC and ERC — only people in the four electoral districts where these parties ran were asked to place them in the left to right scale.

Table A.11. **Left-Right location of parties running in the 2019 elections in Spain**

Party	Avg. Location	SD. Location	N
ECP	3.11	1.32	629
ERC	3.17	1.55	663
PSC	4.85	1.61	716
CDC	5.96	1.88	622
Cs	8.21	1.73	708
PP	8.81	1.33	714
VOX	9.72	0.97	679
Sample	3.73	1.74	712

Notes: Parties are located between 1 and 10, where 1 means left-wing and 10 means right-wing. ECP is replaced by Podemos, the nation-wide party it runs with. For the regional parties — CDC and ERC — only people in the four electoral districts where these parties ran were asked to place them in the left to right scale.

Table A.12. **Location of parties on the Regionalism scale running in the 2016 elections in Barcelona**

Party	Avg. Location	SD. Location	N
PP	1.36	1.16	608
Cs	1.73	1.50	575
PSC	2.34	1.56	572
ECP	5.03	2.17	515
CDC	8.16	1.82	575
ERC	9.05	1.58	583
Sample	4.83	3.14	659

Notes: Parties are located between 1 and 10, where 1 is the least regionalist and 10 is regionalist. For the regional parties — CDC and ERC — only people in the four electoral districts where these parties ran were asked to place them in the left to right scale.

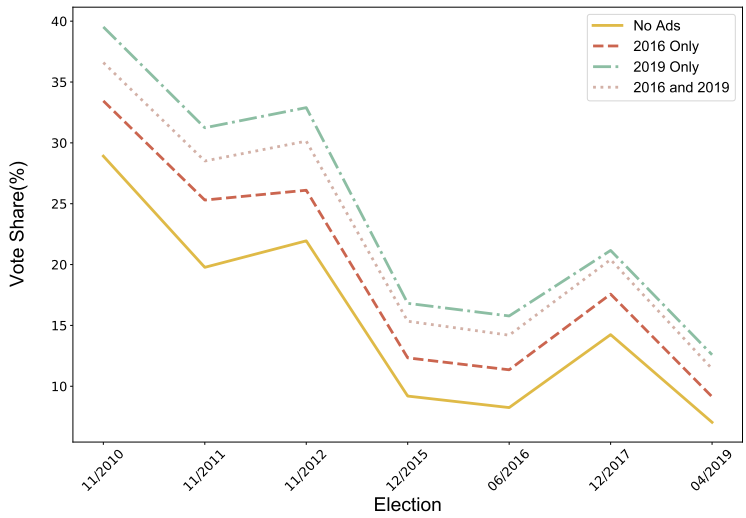


Figure A.15. **Vote Shares for CDC in General and Regional Elections in Barcelona (2010–2019)**

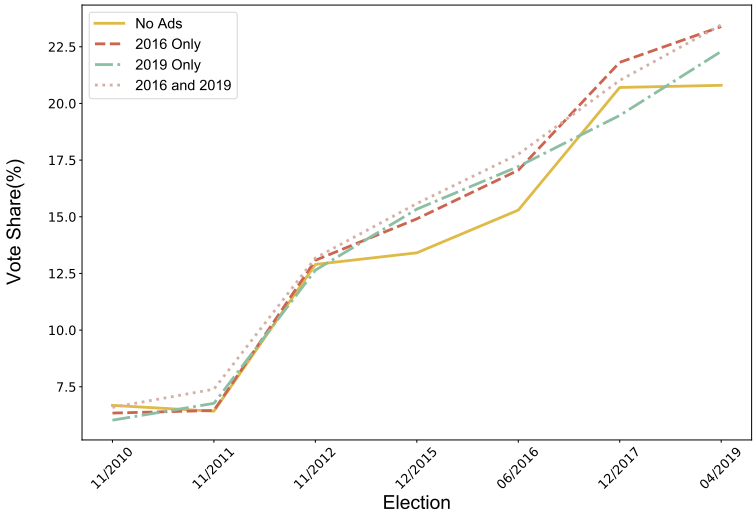


Figure A.16. **Vote Shares for ERC in General and Regional Elections in Barcelona (2010–2019)**

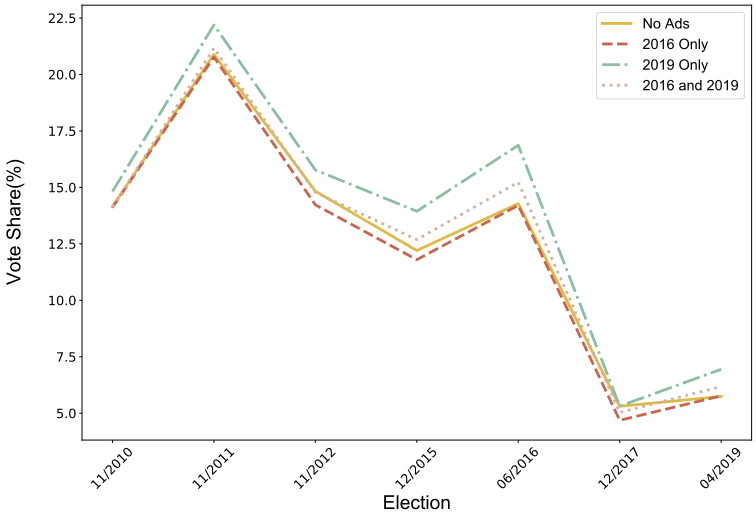


Figure A.17. **Vote Shares for PP in General and Regional Elections in Barcelona (2010–2019)**

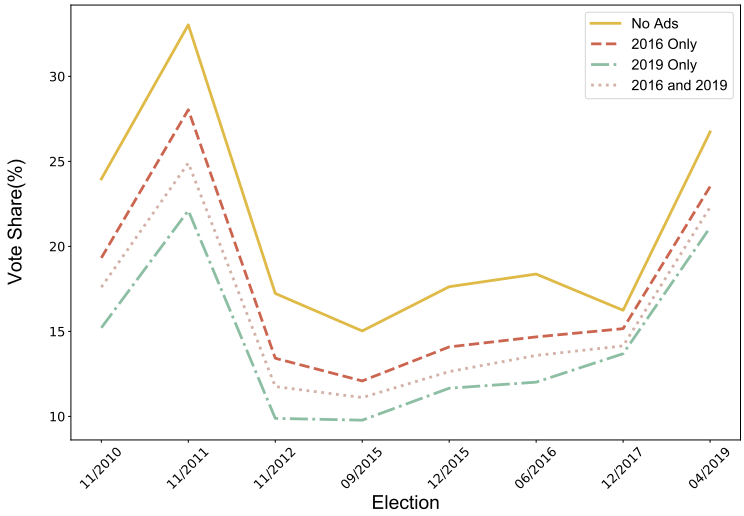


Figure A.18. **Vote Shares for PSC in General and Regional Elections in Barcelona (2010–2019)**

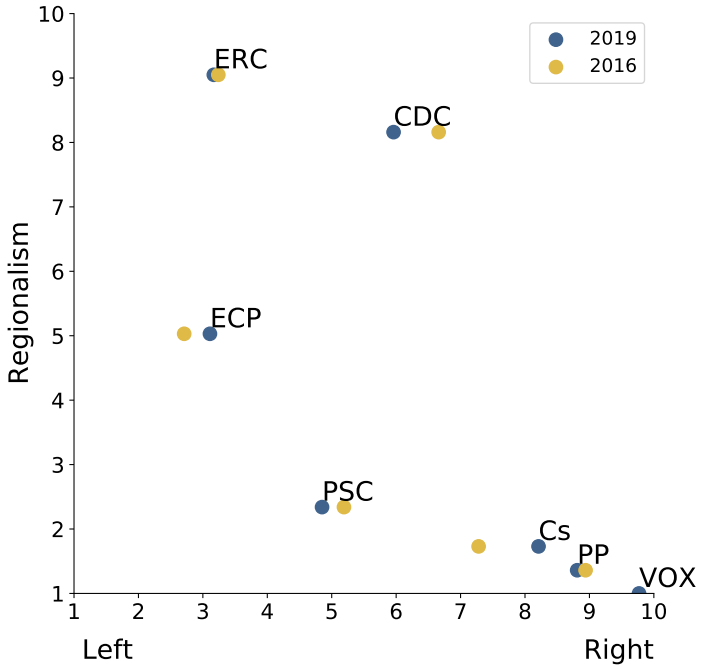


Figure A.19. **Location of Political Parties in Spain**

Table A.13. **Parties Categorized as Close (2019)**

	Left-Right	Nat-Reg	Both
CDC	Cs, ECP, ERC, PP, PSC	ERC	ERC
Cs	CDC, PP, VOX	PP, PSC, VOX	PP, PSC, VOX
ECP	CDC, ERC, PSC	PSC	ERC, PSC
ERC	CDC, ECP, PSC	CDC	CDC, ECP
PP	CDC, Cs, VOX	Cs, PSC, VOX	Cs, VOX
PSC	CDC, ECP, ERC	Cs, ECP, PP, VOX	Cs, ECP
VOX	Cs, PP	Cs, PP, PSC	Cs, PP

Table A.14. **Parties Categorized as Close (2016)**

	Left-Right	Nat-Reg	Both
CDC	Cs, PP, PSC	ERC	ERC
Cs	CDC, PP, PSC	PP, PSC	PP, PSC
ECP	ERC, PSC	PSC	ERC, PSC
ERC	ECP, PSC	CDC	CDC, ECP
PP	CDC, Cs	Cs, PSC	Cs, PSC
PSC	CDC, Cs, ECP, ERC	Cs, ECP, PP	Cs, ECP, PP

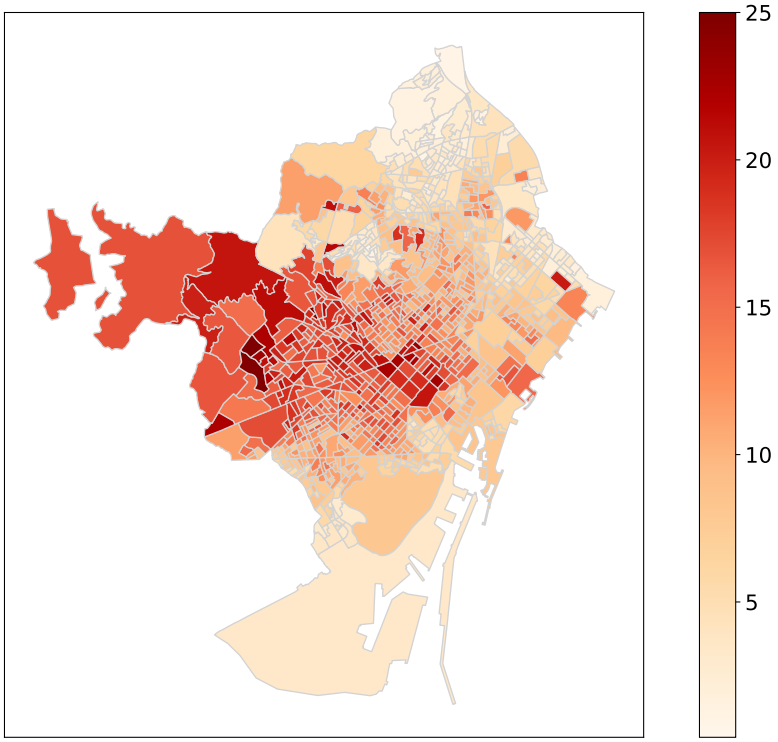


Figure A.20. **Vote Share of CDC in Barcelona (2019)**

D. Turnout and Vote Concentration

So far in this paper we have seen that the number of ads a party has within a given area, as well as what other parties have ads nearby, matters for the party's election results. The fact that other parties' ads also have an effect suggests that voters might be sensitive to the number of parties with ads in that area and how concentrated those ads are in the hands of a single party.

Given that the location of the spots available to host ads is not randomized, it is not possible to identify the effects that ad concentration could have on the concentration of vote shares. For this specification, I add the socio-demographic controls mentioned previously as well as controlling for the number of randomization units that a given section is exposed to. Then I estimate:

$$\text{VoteShareHHI}_i = \beta \, \text{AdHHI}_i + \mathbf{X}_i' \gamma + \sum_{j \neq i} w_{i,j} \text{VoteShareHHI}_j + \varepsilon_i \tag{7}$$

Where AdHHI_i and VoteShareHHI_i is the Herfindahl-Hirschman Index of the ad shares and vote shares in section i, respectively. To compute AdHHI_i I also consider the perimeter of influence around section i.

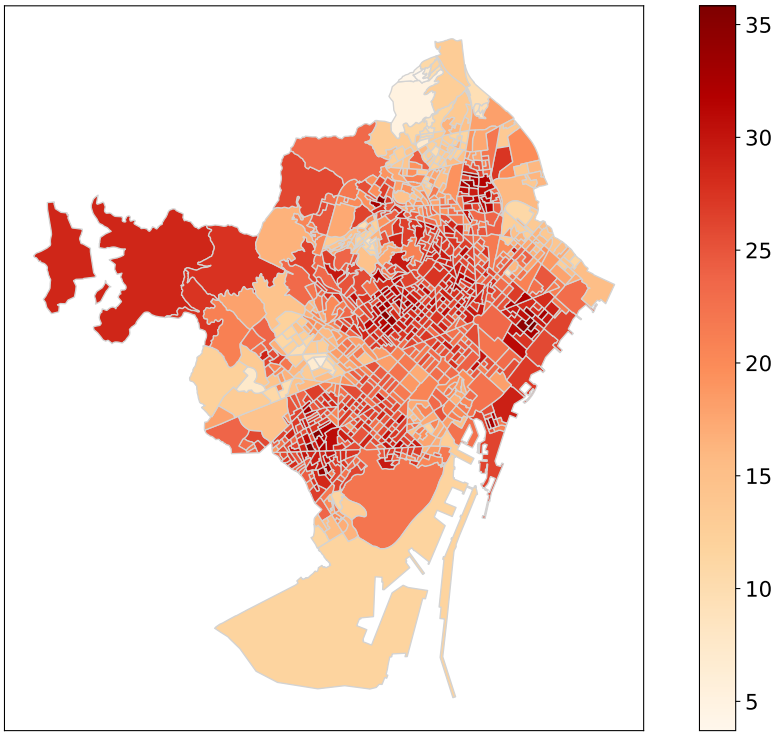
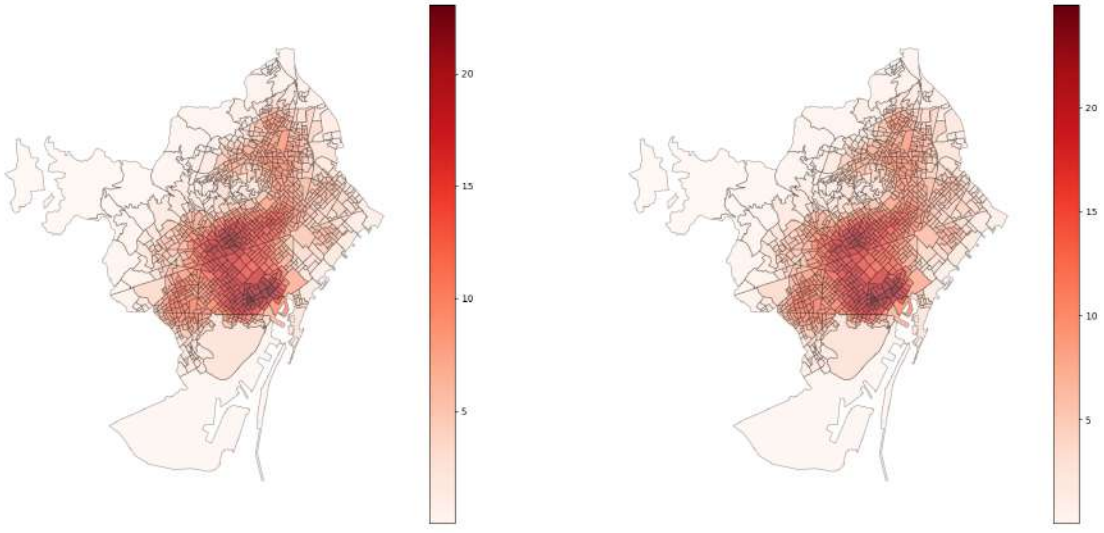
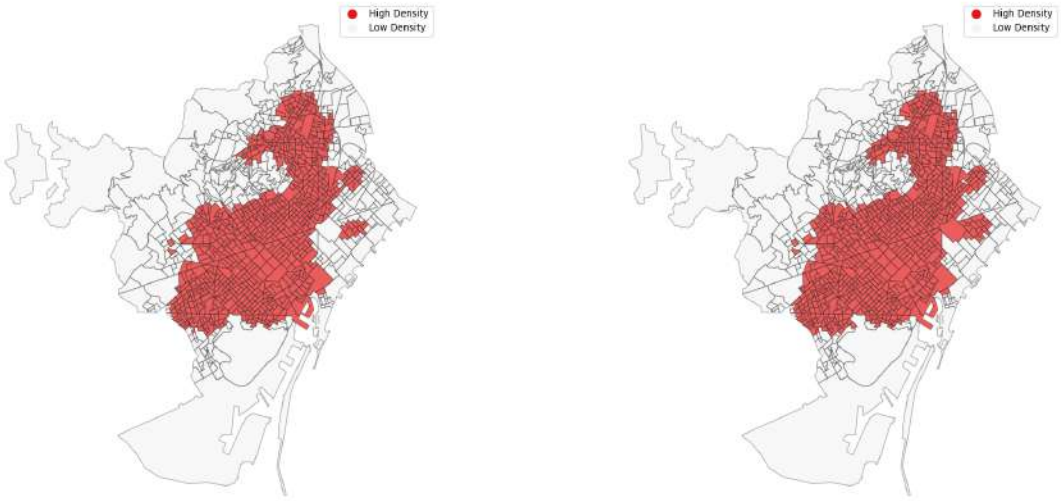


Figure A.21. **Vote Share of ERC in Barcelona (2019)**



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

Figure A.22. **Shops per 100m^2 in Barcelona**



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

Figure A.23. **Low and High shop density sections in Barcelona**

The results displayed in Table A.34 suggest that increasing the concentration of ad shares — i.e. increasing the share of ads held by fewer parties in a given area — has little or no effect on the concentration of vote shares — i.e. a fewer number of parties summing up to a larger vote share.

Then, I turn to the question of whether turnout is affects by electoral ads, a well-studied question in the literature. Since the number and location of ads is not randomized, I use the cross-year variation in areas that were exposed to add to further explore the relationship between ads and turnout.

In order to choose the best suited control group, since there are no socio-demographic characteristics available for years prior to 2015, I use the electoral results for the national and regional elections in Barcelona since 2010.[41]. I compare four groups of sections: (i) the sections that had no ads in either year, (ii) sections that had ads only in 2016, (iii) sections that had ads only in 2019, and (iv) sections that had ads in both years.

[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.

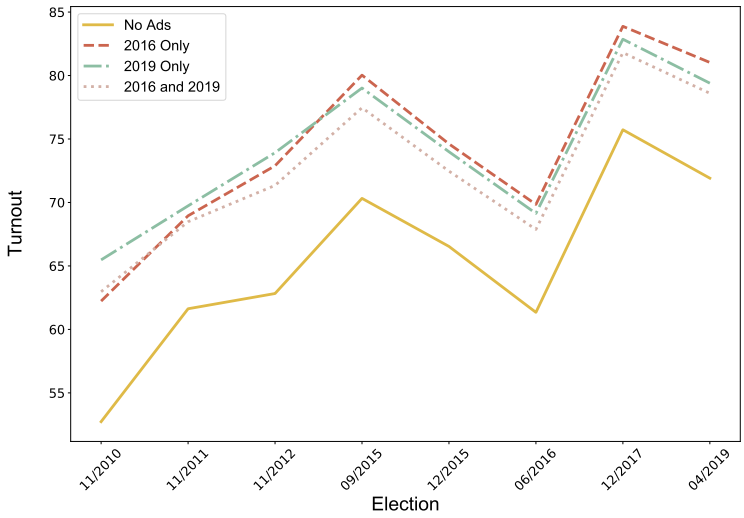


Figure A.24. **Turnout in General and Regional Elections in Barcelona (2010–2019)**

In Figure A.24, I plot the turnout for the four groups described above throughout the eight general and regional elections in Barcelona between 2010 and April 2019. It is clear from the graph that the four groups follow the same trend: an overall increase in turnout interrupted in the 2015 and 2016 general elections. 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 ran in every election from 2010 to 2019.[42] In Figures A.15 to A.18 from Appendix C, it is also quite apparent that for all parties there is a common trend for all four groups. For two of the parties — ERC and PP — all four groups have extremely similar values throughout all elections, and for the other two parties — CDC and PSC — there is at most a ten point spread between groups.

For the purposes of the difference-in-differences analysis, I use the group of sections that only had ads in 2019 as the treatment group. As for the control group, I use either the group of sections that only had ads in 2016 or the group of sections that had ads in both elections.

$$\text{Turnout}_{i,t} = \beta \text{Treat}_{i,t} + \psi_i + \lambda_t + \varepsilon_{i,t} \tag{8}$$

Where $\text{Treat}_{i,t}$ is a binary variable indicating whether section i was treated at time t, and λ_t are year fixed-effects.

[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.

As we can see in Table A.35, the results are similar than above. That is, there is no statistically significant effect of being exposed to ads on turnout. 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)).

Table A.15. **Effects of Own Ad Density on Vote Shares in treated sections**

	Vote Shares		
	2016	2019	2016–2019
	(1)	(2)	(3)
Ad Density	0.734**	1.006***	0.944***
	(0.259)	(0.157)	(0.133)
	[0.321]	[0.170]	[0.186]
Observations	5670	8802	14472
R^2	0.67	0.82	0.73
Moran's I	-0.00	0.00	0.00
Fixed Effects	Yes	Yes	Yes
Spatial Lag	Yes	Yes	Yes

Notes: Ad density refers to the number of ads in $100m^2$. There are section and party fixed effects, and columns (5) and (6) also have year fixed effects. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Fixed effects include party and section fixed effects, as well as year and party-year fixed effects in column (3) Results shown use the 500m perimeter of influence. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

E. Additional Regressions

Table A.16. **Effects of Own Ad Density on Vote Shares in treated sections**

	Vote Shares					
	2016		2019		2016–2019	
	(1)	(2)	(3)	(4)	(5)	(6)
Ad Density	0.719***	—	1.158***	—	1.001***	—
	(0.251)		(0.165)		(0.148)	
	[0.262]		[0.193]		[0.189]	
Banner Density	—	0.781**	—	1.156***	—	1.003***
		(0.253)		(0.165)		(0.148)
		[0.316]		[0.193]		[0.228]
Poster Density	—	-46.373**	—	20.528		-5.145
		(17.878)		(13.488)		(11.891)
		[19.401]		[15.797]		[16.438]
Observations	6734	6734	8802	8802	14472	14472
R^2	0.58	0.64	0.73	0.73	0.53	0.53
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Ad density refers to the number of ads in 100m^2; the same applies for Banner and Poster density. There are section and party fixed effects, as well as year and party-year fixed effects in columns (5) and (6). The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table A.17. **Effects of Own Ad Density on Vote Shares by Buffers (2016)**

	Vote Shares				
	300	350	400	450	500
Ad Density	0.514**	0.619**	0.710**	0.831**	0.843**
	(0.198)	(0.218)	(0.239)	(0.259)	(0.278)
	[0.256]	[0.282]	[0.310]	[0.335]	[0.360]
Observations	5894	6146	6391	6629	6734
R^2	0.58	0.58	0.58	0.58	0.58
Fixed Effects	Yes	Yes	Yes	Yes	Yes

Notes: Ad density refers to the number of ads in $100m^2$. There are section and party fixed effects. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table A.18. **Effects of Own Ad Density on Vote Shares by Buffers (2019)**

	Vote Shares				
	300	350	400	450	500
Ad Density	0.651***	0.746***	0.861***	1.011***	1.158***
	(0.174)	(0.193)	(0.212)	(0.232)	(0.251)
	[0.135]	[0.147]	[0.160]	[0.175]	[0.193]
Observations	8082	8082	8388	8703	8802
R^2	0.79	0.79	0.79	0.79	0.79
Fixed Effects	Yes	Yes	Yes	Yes	Yes

Notes: Ad density refers to the number of ads in $100m^2$. There are section and party fixed effects. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table A.19. **Effects of Own Ad Density on Vote Shares by Buffers (2016–2019)**

	Vote Shares				
	300	350	400	450	500
Ad Density	0.560***	0.648***	0.742***	0.865***	0.952***
	(0.095)	(0.104)	(0.114)	(0.124)	(0.134)
	[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
Fixed Effects	Yes	Yes	Yes	Yes	Yes

Notes: Ad density refers to the number of ads in 100m^2. There are section and party fixed effects. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table A.20. **Effects of Ads on Vote Shares by Buffers (2016)**

	Vote Shares				
	300	350	400	450	500
Ad Density	0.008**	0.008**	0.008**	0.008**	0.007**
	(0.004)	(0.003)	(0.003)	(0.003)	(0.002)
	[0.004]	[0.003]	[0.003]	[0.003]	[0.002]
Observations	4830	5106	5322	5550	5670
R^2	0.63	0.63	0.63	0.63	0.63
Fixed Effects	Yes	Yes	Yes	Yes	Yes

Notes: Ad density refers to the number of ads in 100m^2. There are section and party fixed effects. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table A.21. **Effects of Ads on Vote Shares by Buffers (2019)**

	Vote Shares				
	300	350	400	450	500
Ad Density	0.011***	0.010***	0.010***	0.009***	0.009***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
	[0.002]	[0.002]	[0.002]	[0.002]	[0.001]
Observations	7749	8082	8388	8703	8802
R^2	0.79	0.79	0.79	0.79	0.79
Fixed Effects	Yes	Yes	Yes	Yes	Yes

Notes: Ad density refers to the number of ads in 100m^2. There are section and party fixed effects. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table A.22. **Effects of Own Ad Density on Raw Vote Shares in treated sections**

	Raw Vote Shares		
	2016	2019	2016–2019
Ad Density	0.537**	0.981***	0.772***
	(0.190)	(0.132)	(0.111)
	[0.244]	[0.229]	[0.150]
Observations	6734	8802	15536
R^2	0.58	0.79	0.55
Fixed Effects	Yes	Yes	Yes

Notes: Ad density refers to the number of ads in 100m^2. There are section and party fixed effects, and columns (5) and (6) also have year fixed effects. Results shown use 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 A.23. **Effects of Ad Density on Vote Shares by Party (2016)**

	Vote Shares				
	CDC	Cs	ECP	ERC	PP
Ad Density	-0.856**	0.530	0.033	2.631***	0.152
	(0.358)	(0.326)	(0.279)	(0.465)	(0.531)
	[0.400]	[0.347]	[0.282]	[0.513]	[0.578]
Observations	945	945	945	945	945
R^2	0.81	0.59	0.84	0.60	0.64
Moran's I	0.03	-0.03	0.00	-0.10***	-0.01
Spatial Lag	No	Yes	No	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes

Notes:Ad density refers to the number of ads in $100m^2$. Controls include average household income, average percentage of income deriving from pensions, percentage of the population that have an income per consumption unit below 40% of the median, the total number of ads, total number of randomization units, and population in 2016. There are city district fixed effects. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets. CDC stands for Convergència Democràtica de Catalunya, Cs stands for Ciutadans, ECR stands for En Comú Podem, ERC stands for Esquerra Republicana de Catalunya, PP stands for Partido Popular, and PSC stands for Partit dels Socialistes de Catalunya.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table A.24. **Effects of Ad Density on Vote Shares by Party (2019)**

	Vote Shares						
	CDC	Cs	ECP	ERC	PP	PSC	VOX
Ad Density	1.190***	-0.825***	0.591***	1.605***	1.208***	1.270**	-0.517
	(0.423)	(0.237)	(0.215)	(0.345)	(0.372)	(0.542)	(0.578)
	[0.440]	[0.237]	[0.222]	[0.401]	[0.356]	[0.578]	[0.562]
Observations	978	978	978	978	978	978	978
R^2	0.77	0.60	0.74	0.56	0.58	0.73	0.46
Moran's I	0.06	0.06	-0.03	-0.05	0.04	-0.03	0.01
Spatial Lag	No	Yes	No	Yes	No	Yes	No
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Ad density refers to the number of ads in $100m^2$. Controls include average household income, average percentage of income deriving from pensions, percentage of the population that have an income per consumption unit below 40% of the median, the total number of ads, total number of randomization units, and population in 2017. There are city district fixed effects. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets. CDC stands for Convergència Democràtica de Catalunya and on that year the party was running as "Junts per Catalunya". Cs stands for Ciutadans, ECR stands for En Comú Podem, ERC stands for Esquerra Republicana de Catalunya, PP stands for Partido Popular, and PSC stands for Partit dels Socialistes de Catalunya.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table A.25. **Effects of Ad Density on Raw Vote Shares by Party (2016)**

	Vote Shares					
	CDC	Cs	ECP	ERC	PP	PSC
Ad Density	-0.708**	0.602**	0.054	1.688***	0.284	-0.576**
	(0.247)	(0.231)	(0.199)	(0.332)	(0.389)	(0.223)
	[0.279]	[0.256]	[0.193]	[0.363]	[0.439]	[0.252]
Observations	962	962	962	962	962	962
R^2	0.81	0.59	0.84	0.59	0.64	0.78
Moran's I	-0.07*	-0.04	0.01	-0.11***	-0.01	-0.07*
Spatial Lag	Yes	No	No	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes:Ad density refers to the number of ads in $100m^2$. Controls include average household income, average percentage of income deriving from pensions, percentage of the population that have an income per consumption unit below 40% of the median, the total number of ads, and population in 2016. There are city district fixed effects. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets. CDC stands for Convergència Democràtica de Catalunya, Cs stands for Ciutadans, ECR stands for En Comú Podem, ERC stands for Esquerra Republicana de Catalunya, PP stands for Partido Popular, and PSC stands for Partit dels Socialistes de Catalunya.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

*

Table A.26. **Effects of Ad Density on Raw Vote Shares by Party (2019)**

	Vote Shares						
	CDC	Cs	ECP	ERC	PP	PSC	VOX
Ad Density	0.915**	-0.801***	0.560***	1.452***	0.972***	1.022**	-0.267
	(0.361)	(0.189)	(0.174)	(0.295)	(0.284)	(0.425)	(0.449)
	[0.379]	[0.197]	[0.180]	[0.]	[0.280]	[0.]	[0.436]
Observations	978	978	978	978	978	978	978
R^2	0.78	0.64	0.67	0.58	0.61	0.63	0.50
Moran's I	-0.04	0.01	-0.04	-0.04	-0.05	-0.10***	0.01
Spatial Lag	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	No	No	Yes	Yes	No	No

Notes: Ad density refers to the number of ads in $100m^2$. Controls include average household income, average percentage of income deriving from pensions, percentage of the population that have an income per consumption unit below 40% of the median, the total number of ads, and population in 2017. There are city district fixed effects. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table A.27. **Effects of Own and Other Parties' Ad Density on Vote Shares (2016)**

	Vote Shares				
	(1)	(2)	(3)	(4)	(5)
Ad Density	0.784***	—	—	1.297***	0.156
	(0.273)			(0.278)	(0.301)
	[0.329]			[0.319]	[0.352]
Ad Density	—	0.795***	—	1.141***	—
Close Parties		(0.205)		(0.215)	
		[0.216]		[0.222]	
Ad Density	—	—	-1.189***	—	-1.141***
Distant Parties			(0.191)		(0.215)
			[0.198]		[0.222]
Observations	5772	5772	5772	5772	5772
R^2	0.36	0.37	0.37	0.37	0.37
Moran's I	0.00	-0.00	0.00	-0.00	-0.00
Fixed Effects	Yes	Yes	Yes	Yes	Yes
Spatial Lag	No	No	No	No	No

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 3 points away from party p in the 1-10 left-right ideological scale. There are section and party fixed effects. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table A.28. **Effects of Own and Other Parties' Ad Density on Vote Shares (2019)**

	Vote Shares				
	(1)	(2)	(3)	(4)	(5)
Ad Density	1.198***	—	—	0.902***	1.347***
	(0.179)			(0.184)	(0.191)
	[0.202]			[0.228]	[0.204]
Ad Density	—	-0.760***	—	-0.445***	—
Close Parties		(0.129)		(0.133)	
		[0.125]		[0.139]	
Ad Density	—	—	0.159	—	0.445***
Distant Parties			(0.124)		(0.133)
			[0.137]		[0.139]
Observations	6846	6846		6846	6846
R^2	0.71	0.71	0.71	0.71	0.71
Moran's I	0.00	-0.00	0.00	-0.00	-0.00
Fixed Effects	Yes	Yes	Yes	Yes	Yes
Spatial Lag	No	No	No	No	No

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 3 points away from party p in the 1-10 left-right ideological scale. There are section and party fixed effects. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table A.29. **Effects of Own and Other Parties' Ad Density on Vote Shares (2016) — Two Dimensions**

	Vote Shares				
	(1)	(2)	(3)	(4)	(5)
Ad Density	1.027**	—	—	0.976***	1.501***
	(0.311)			(0.317)	(0.417)
	[0.400]			[0.431]	[0.335]
Ad Density	—	-0.671*	—	-0.525	—
Close Parties		(0.332)		(0.333)	
		[0.378]		[0.390]	
Ad Density	—	—	-0.403	—	0.525
Distant Parties			(0.250)		(0.333)
			[0.377]		[0.390]
Observations	4725	4725	4725	4725	4725
R^2	0.41	0.41	0.41	0.41	0.41
Moran's I	0.00	-0.00	0.00	0.00	0.00
Fixed Effects	Yes	Yes	Yes	Yes	Yes
Spatial Lag	No	No	No	No	No

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. Ad density Distant parties refers to the number of ads of parties that are over 4 points away from party p. There are section and party fixed effects. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table A.30. **Effects of Own and Other Parties' Ad Density on Vote Shares (2019) — Two Dimensions**

	Vote Shares				
	(1)	(2)	(3)	(4)	(5)
Ad Density	1.198***	—	—	1.227***	1.163***
	(0.179)			(0.187)	(0.205)
	[0.202]			[0.267]	[0.142]
Ad Density	—	-0.284**	—	0.064	—
Close Parties		(0.148)		(0.156)	
		[0.119]		[0.177]	
Ad Density	—	—	-0.443***	—	-0.064
Distant Parties			(0.138)		(0.156)
			[0.203]		[0.177]
Observations	6762	6762	6762	6762	6762
R^2	0.71	0.71	0.71	0.71	0.71
Moran's I	0.00	-0.00	0.00	-0.00	-0.00
Fixed Effects	Yes	Yes	Yes	Yes	Yes
Spatial Lag	No	No	No	No	No

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. Ad density Distant parties refers to the number of ads of parties that are over 4 points away from party p. There are section and party fixed effects. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table A.31. **Effects of Own and Other Parties' Ad Density on Vote Shares (2016–2019) — Two Dimensions**

	Vote Shares				
	(1)	(2)	(3)	(4)	(5)
Ad Density	1.001***	—	—	0.963***	0.846***
	(0.148)			(0.153)	(0.164)
	[0.205]			[0.242]	[0.149]
Ad Density	—	-0.357***	—	-0.133	—
Close Parties		(0.127)		(0.132)	
		[0.117]		[0.156]	
Ad Density	—	—	-0.531***	—	-0.303**
Distant Parties			(0.110)		(0.121)
			[0.174]		[0.148]
Observations	12618	12618	12618	12618	12618
R^2	0.42	0.42	0.42	0.42	0.42
Moran's I	-0.00	0.00	0.00	-0.00	-0.00
Fixed Effects	Yes	Yes	Yes	Yes	Yes
Spatial Lag	No	No	No	No	No

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. Ad density Distant parties refers to the number of ads of parties that are over 4 points away from party p. There are section, year, and party fixed effects. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table A.32. **Effects of Close Parties' Ad Density on Vote Shares (2016)**

	Vote Shares					
	CDC	Cs	ECP	ERC	PP	PSC
Ad Density	0.230	0.413**	-0.162	0.830***	1.619***	-0.225
Close Parties	(0.291)	(0.326)	(0.190)	(0.275)	(0.401)	(0.237)
	[0.342]	[0.207]	[0.250]	[0.302]	[0.407]	[0.249]
Observations	962	962	962	962	962	962
R^2	0.81	0.58	0.74	0.59	0.65	0.73
Moran's I	0.02	0.05	0.00	-0.11***	-0.02	-0.05
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Spatial Lag	No	No	No	Yes	Yes	Yes

Notes: Ad density Close Parties refers to the number of ads of parties in $100m^2$that are no more than 3 points away from party p in the 1-10 left-right ideological scale. Controls include average household income, average percentage of income deriving from pensions, percentage of the population that have an income per consumption unit below 40% of the median, the total number of ads, and population in 2017. There are city district fixed effects. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table A.33. **Effects of Close Parties' Ad Density on Vote Shares (2019)**

	Vote Shares					
	CDC	Cs	ECP	ERC	PP	PSC
Ad Density	-0.401	0.437	-0.506***	-1.743***	-0.678***	-0.574**
Close Parties	(0.273)	(0.325)	(0.189)	(0.317)	(0.161)	(0.239)
	[0.282]	[0.361]	[0.195]	[0.359]	[0.166]	[0.265]
Observations	978	978	978	978	978	978
R^2	0.76	0.58	0.74	0.55	0.57	0.72
Moran's I	0.05	0.02	-0.03	-0.09**	0.04	-0.06
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Spatial Lag	No	No	No	Yes	No	Yes

Notes: Ad density Close Parties refers to the number of ads of parties in $100m^2$that are no more than 3 points away from party p in the 1-10 left-right ideological scale. Controls include average household income, average percentage of income deriving from pensions, percentage of the population that have an income per consumption unit below 40% of the median, the total number of ads, and population in 2017. There are city district fixed effects. Heteroskedasticity-robust standard errors are reported in parentheses, Conley standard errors are reported in squared brackets.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table A.34. **Effects of Ad concentration on Vote Concentration and Turnout**

	Vote Share HHI		Turnout			
	2016	2019	2016		2019	
	(1)	(2)	(3)	(4)	(5)	(6)
Ad HHI	0.007**	0.001	—	-0.000	—	-0.000
	(0.003)	(0.002)		(0.000)		(0.000)
	[0.003]	[0.002]		[0.000]		[0.000]
Ad Density	—	—	0.135	0.134	0.038	0.032
			(0.136)	(0.141)	(0.178)	(0.179)
			[0.141]	[0.146]	[0.174]	[0.175]
Observations	962	978	962	962	978	978
R^2	0.38	0.49	0.73	0.73	0.72	0.72
Moran's I	-0.05	-0.5	0.03	0.03	0.04	0.04
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Spatial Lag	Yes	Yes	No	No	No	No

Notes: Ad density refers to the number of ads in $100m^2$. Ad HHI refers to the Herfindahl-Hirschman Index computed from relative ad shares at the section level. Vote Share HHI refers to the Herfindahl-Hirschman Index computed from relative vote shares at the section level. Controls include average household income, average percentage of income deriving from pensions, percentage of the population that have an income per consumption unit below 40% of the median, the total number of ads, and population in 2016. There are city district fixed effects. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence. .

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table A.35. **Effects of Ad Density on Turnout**

	Turnout			
	(1)	(2)	(3)	(4)
Treat	-0.742	-0.769	0.213	0.205
	(0.764)	(0.787)	(0.688)	(0.697)
Observations	180	180	212	212
R^2	0.98	0.98	0.98	0.98
Controls	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
Spatial Lag	No	Yes	No	Yes

Notes: Treat is a binary variable indicating whether a given section is in the group of sections that were exposed to ads in 2016 only — columns (1) and (2) — or in 2019 only — columns (3) and (4). Year refers to a binary variable equal to 1 if the year is 2016 for columns (1) and (2) and is equal to 1 if the year is 2019 for columns (3) and (4). Controls include average household income, average percentage of income deriving from pensions, percentage of the population that have an income per consumption unit below 40% of the median, the total number of ads, and population in 2016. There are section fixed effects. The weights for the spatially lagged variable are computed by using an inverse distance matrix between the sections.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table A.36. **Effects of Ads on Vote Shares (2016)**

	Vote Shares					
	CDC	Cs	ECP	ERC	PP	PSC
Ads	-0.007***	0.005**	0.004*	0.018***	0.001	-0.004
	(0.003)	(0.002)	(0.002)	(0.004)	(0.004)	(0.003)
	[0.003]	[0.003]	[0.002]	[0.004]	[0.004]	[0.003]
Observations	962	962	962	962	962	962
R^2	0.81	0.59	0.84	0.60	0.64	0.78
Moran's I	0.03	0.06	-0.01	-0.10***	-0.01	-0.02
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Spatial Lag	No	No	No	Yes	Yes	Yes

Notes: Conley standard errors are reported in brackets. Controls include average household income, average percentage of income deriving from pensions, percentage of the population that have an income per consumption unit below 40% of the median, the total number of ads, area of the section, and population in 2016. There are city district fixed effects. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table A.37. **Effects of Ads on Vote Shares (2019)**

	Vote Shares						
	CDC	Cs	ECP	ERC	PP	PSC	VOX
Ads	0.009***	-0.007***	0.004**	0.012***	0.009***	0.008**	-0.003
	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.005)
	[0.004]	[0.002]	[0.002]	[0.003]	[0.002]	[0.004]	[0.005]
Observations	978	978	978	978	978	978	978
R^2	0.77	0.59	0.74	0.56	0.58	0.73	0.46
Moran's I	0.05	-0.03	-0.03	-0.06	0.05	-0.03	0.01
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Spatial Lag	No	No	No	Yes	No	Yes	No

Notes: Conley standard errors are reported in brackets. Controls include average household income, average percentage of income deriving from pensions, percentage of the population that have an income per consumption unit below 40% of the median, the total number of ads, area of the section, and population in 2016. There are city district fixed effects. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table A.38. **Ad Density and Heterogeneous Effects of Section Characteristics (2016)**

	Vote Shares		
	(1)	(2)	(3)
Ad Density	2.125***	1.529***	2.776***
	(0.333)	(0.463)	(0.494)
	[0.392]	[0.488]	[0.538]
Ad Density × High Income	-3.520***	—	-3.461***
	(0.461)		(0.464)
	[0.508]		[0.506]
Ad Density × High Age	—	-1.246**	-1.038**
		(0.525)	(0.519)
		[0.524]	[0.506]
Observations	6734	6734	6734
R^2	0.58	0.58	0.58
Moran's I	-0.00	0.00	0.00
Spatial Lag	No	No	No
Fixed Effects	Yes	Yes	Yes

Notes: Ad density refers to the number of ads per $100m^2$ of party p in section i. Ad density × High 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 × High 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. There are party and section fixed effects. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table A.39. **Ad Density and Heterogeneous Effects of Section Characteristics (2019)**

	Vote Shares		
	(1)	(2)	(3)
Ad Density	2.125***	1.529***	2.776***
	(0.333)	(0.463)	(0.494)
	[0.392]	[0.488]	[0.538]
Ad Density × High Income	-3.520***	—	-3.461***
	(0.461)		(0.464)
	[0.508]		[0.506]
Ad Density × High Age	—	-1.246**	-1.038**
		(0.525)	(0.519)
		[0.524]	[0.506]
Observations	6734	6734	6734
R^2	0.58	0.58	0.58
Moran's I	-0.00	0.00	0.00
Spatial Lag	No	No	No
Fixed Effects	Yes	Yes	Yes

Notes: Ad density refers to the number of ads per $100m^2$ of party p in section i. Ad density × High 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 × High 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. There are party and section fixed effects. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table A.40. **Effects of Other Parties' Ad Density on Vote Shares (2016)**

	Vote Shares					
	Left			Right		
	(1)	(2)	(3)	(4)	(5)	(6)
Ad Density Close Parties	-1.468***	-0.235	—	2.374***	1.765***	—
	(0.446)	(0.345)		(0.543)	(0.354)	
	[0.391]	[0.364]		[0.509]	[0.393]	
Ad Density Distant Parties	-1.458***	—	-0.478	0.716	—	-0.856*
	(0.419)		(0.314)	(0.583)		(0.395)
	[0.468]		[0.374]	[0.620]		[0.471]
Observations	2886	2886	2886	2886	2886	2886
R^2	0.62	0.62	0.62	0.57	0.57	0.56
Moran's I	-0.00	-0.00	-0.00	0.00	-0.00	-0.00
Spatial Lag	No	No	No	No	No	No
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Ad density Close Parties refers to the number of ads per $100m^2$ of parties that are no more than 4 points away from party p. Ad density Distant parties refers to the number of ads per $100m^2$ of parties that are over 4 points away from party p. Heteroskedasticity-robust standard errors are shown in parentheses and Conley standard errors are reported in brackets. There are party and section fixed effects. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table A.41. **Effects of Other Parties' Ad Density on Vote Shares (2019)**

	Vote Shares					
	Left			Right		
	(1)	(2)	(3)	(4)	(5)	(6)
Ad Density Close Parties	-1.246***	-0.870***	—	-0.033	0.016	—
	(0.302)	(0.241)		(0.263)	(0.160)	
	[0.260]	[0.198]		[0.298]	[0.184]	
Ad Density Distant Parties	-0.947**	—	-0.170	-0.066	—	-0.038
	(0.386)		(0.314)	(0.333)		(0.203)
	[0.428]		[0.353]	[0.414]		[0.254]
Observations	2934	2934	2934	3912	3912	3912
R^2	0.48	0.47	0.47	0.70	0.70	0.70
Moran's I	-0.00	-0.00	-0.00	0.00	-0.00	-0.00
Spatial Lag	No	No	No	No	No	No
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Ad density Close Parties refers to the number of ads per $100m^2$ of parties that are no more than 4 points away from party p. Ad density Distant parties refers to the number of ads per $100m^2$ of parties that are over 4 points away from party p. Heteroskedasticity-robust standard errors are shown in parentheses and Conley standard errors are reported in brackets. There are party and section fixed effects. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table A.42. **Effects of Other Parties' Ad Density on Vote Shares (2016)**

	Vote Shares					
	Old			New		
	(1)	(2)	(3)	(4)	(5)	(6)
Ad Density	0.417	1.111***	—	0.113	1.226	—
Close Parties	(0.494)	(0.302)		(1.074)	(0.983)	
	[0.406]	[0.393]		[0.861]	[0.861]	
Ad Density	-0.796	—	-1.090**	-1.260***	—	-1.288***
Distant Parties	(0.437)		(0.268)	(0.477)		(0.453)
	[0.550]		[0.437]	[0.393]		[0.372]
Observations	3848	3848	3848	1924	1924	1924
R^2	0.12	0.12	0.12	0.71	0.71	0.71
Moran's I	-0.00	-0.00	-0.00	0.00	-0.00	-0.00
Spatial Lag	No	No	No	No	No	No
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Ad density Close Parties refers to the number of ads per $100m^2$ of parties that are no more than 4 points away from party p. Ad density Distant parties refers to the number of ads per $100m^2$ of parties that are over 4 points away from party p. Heteroskedasticity-robust standard errors are shown in parentheses and Conley standard errors are reported in brackets. There are party and section fixed effects. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table A.43. **Effects of Own and Other Parties' Ad Density on Vote Shares (2019)**

	Vote Shares					
	Old			New		
	(1)	(2)	(3)	(4)	(5)	(6)
Ad Density Close Parties	-2.638***	-0.820***	—	0.730***	0.709***	—
	(0.339)	(0.224)		(0.243)	(0.195)	
	[0.331]	[0.222]		[0.223]	[0.180]	
Ad Density Distant Parties	-2.331***	—	-0.461*	0.027	—	-0.408**
	(0.341)		(0.223)	(0.242)		(0.191)
	[0.447]		[0.277]	[0.257]		[0.198]
Observations	3912	3912	3912	2934	2934	2934
R^2	0.70	0.69	0.69	0.74	0.74	0.73
Moran's I	0.00	0.00	-0.00	-0.00	-0.00	-0.00
Spatial Lag	No	No	No	No	No	No
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Ad density Close Parties refers to the number of ads per $100m^2$ of parties that are no more than 4 points away from party p. Ad density Distant parties refers to the number of ads per $100m^2$ of parties that are over 4 points away from party p. Heteroskedasticity-robust standard errors are shown in parentheses and Conley standard errors are reported in brackets. There are party and section fixed effects. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table A.44. **Ad Density and Heterogeneous Effects of Income & Age (2019)**

	Vote Shares		
	(1)	(2)	(3)
Ad Density	2.125***	1.529***	2.776***
	(0.333)	(0.463)	(0.494)
	[0.392]	[0.488]	[0.538]
Ad Density × High Income	-3.520***	—	-3.461***
	(0.461)		(0.464)
	[0.508]		[0.506]
Ad Density × High Age	—	-1.246**	-1.038**
		(0.525)	(0.519)
		[0.524]	[0.506]
Observations	6734	6734	6734
R^2	0.58	0.58	0.58
Moran's I	-0.00	0.00	0.00
Spatial Lag	No	No	No
Fixed Effects	Yes	Yes	Yes

Notes: Ad density refers to the number of ads per $100m^2$ of party p in section i. Ad density × High 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 × High 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. There are party and section fixed effects. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table A.45. **Effects of Own & Other Parties' Ad Density on Vote Shares (2016)**

	Vote Shares					
	Extremists			Centrists		
	(1)	(2)	(3)	(4)	(5)	(6)
Ad Density	2.805***	—	—	-0.106	—	—
	(0.939)			(0.355)		
	[0.888]			[0.403]		
Ad Density		0.163	—	—	1.201***	—
Close Parties		(0.851)			(0.292)	
		[0.697]			[0.300]	
Ad Density		—	-1.229**	—	—	-0.909***
Distant Parties			(0.604)			(0.275)
			[0.531]			[0.345]
Observations	1924	1924	1924	3848	3848	3848
R^2	0.20	0.19	0.19	0.47	0.47	0.47
Moran's I	0.00	-0.00	-0.00	0.00	0.00	0.00
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Spatial Lag	No	No	No	No	No	No

Notes: Ad density refers to the number of ads per $100m^2$ of party p in section i.Ad density Close Parties refers to the number of ads per $100m^2$ of parties that are no more than 4 points away from party p. Ad density Distant parties refers to the number of ads per $100m^2$ of parties that are over 4 points away from party p. Heteroskedasticity-robust standard errors are shown in parentheses and Conley standard errors are reported in brackets. There are party and section fixed effects. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table A.46. **Effects of Own & Other Parties' Ad Density on Vote Shares (2019)**

	Vote Shares					
	Extremists			Centrists		
	(1)	(2)	(3)	(4)	(5)	(6)
Ad Density	0.924***	—	—	2.617***	—	—
	(0.244)			(0.439)		
	[0.274]			[0.354]		
Ad Density		-0.955***	—	—	0.037	—
Close Parties		(0.268)			(0.306)	
		[0.292]			[0.341]	
Ad Density		—	0.077	—	—	-1.214***
Distant Parties			(0.262)			(0.329)
			[0.813]			[0.407]
Observations	3912	3912	3912	2934	2934	2934
R^2	0.82	0.82	0.82	0.51	0.49	0.50
Moran's I	0.00	-0.00	0.00	-0.00	-0.00	-0.00
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Spatial Lag	No	No	No	No	No	No

Notes: Ad density refers to the number of ads per $100m^2$ of party p in section i.Ad density Close Parties refers to the number of ads per $100m^2$ of parties that are no more than 4 points away from party p. Ad density Distant parties refers to the number of ads per $100m^2$ of parties that are over 4 points away from party p. Heteroskedasticity-robust standard errors are shown in parentheses and Conley standard errors are reported in brackets. There are party and section fixed effects. The weights for the spatially lagged variable and Moran's I are computed by using an inverse distance matrix between the sections. Results shown use the 500m perimeter of influence.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.