

**Understanding Visible Political Participation:
An Analysis of Yard Sign-Displays during the 2008 Presidential Election**

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Displaying a political yard sign is a conspicuous element of the election experience but an understudied act of political participation. We argue that the study of spatial patterns in the dissemination of yard signs speaks to the debate over “context” as a cause of political participation. We ask whether evidence of such contextual effects exist, and if so, how they operate: through the micro-social environment and interpersonal communication, or the meso-social environment and impersonal information cues?

To address these questions, we utilize an original, geo-coded observational dataset of more than 25,000 households in Franklin County, Ohio from the 2008 presidential election cycle. In addition to traditional predictors of participation, we find evidence that spatial dependence exists in the distribution of yard signs at both the property level and at the Census block level, indicating that both contextual mechanisms are simultaneously important in creating the “sign wars” often observed in neighborhoods.

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Introduction

If the metaphor of an election “season” in the United States is apt, surely its bounty must be the ubiquitous political yard sign, sprouting up in seemingly every front yard. During a campaign season our everyday environments become repositories of political messages, slogans, and images. Seeing a yard sign while idling at an intersection transports a candidate from obscurity to recognition; walking down a sidewalk can give us the feeling that we are on a particular candidate’s turf.

Unlike other forms of political participation, the displaying of political signs and symbols is both highly communicative and *confrontational* – preferences are on display that would otherwise remain unobserved (Huckfeldt and Sprague 1992). In this sense then, campaign season makes both the public and private spheres – at least potentially – coercive contexts (Huckfeldt and Sprague 1995). Individuals can change the channel when political commercials are aired, and they can avoid interpersonal disagreement, but they cannot control their exposure to the yard signs that blanket their neighborhoods.

Nonetheless, the displaying of political yard signs has often been ignored in the study of political participation, often relegated to a battery of items that creates a broader index of political acts (e.g., Mutz 2002; Verba et al. 1995). In this paper, we argue that putting one’s preferences on display is a unique act worthy of specific study, and one that helps us understand individual patterns of political engagement, communication, and participation in a rich, multi-layered geographic context. Moreover, the display of yard signs has important consequences in the aggregate, communicating expectations about proper political behavior in a geographic space (Huckfeldt and Sprague 1992).

Using an original, geo-coded observational dataset of more than 25,000 properties in Franklin County, Ohio collected over the course of the 2008 presidential election cycle, we examine spatial patterns in the dissemination of political yard signs in general, and for the two major presidential candidates, Barack Obama and John McCain. In seeking to understand why households display signs, and why some neighborhoods become inundated with signs, we look not only at individual-level factors and micro-social environments (e.g., McClurg 2006; Mutz 2006), but at intermediate levels of social context such as the Census block and the voting precinct. In so doing, we address the question of whether contextual effects are driven by interpersonal communication or by informational cues in the broader political context.

The remainder of the paper is organized as follows. First, we discuss how the study of yard signs fits into ongoing debates about mechanisms of contextual effects: whether individuals respond to interpersonal discussion or take cues from a broader information environment. Second, we discuss the parameters of the Franklin County Neighborhoods and Elections Study, the source of data for this study. Third, we engage in exploratory data analysis and analyze spatial regression models at the Census block level, demonstrating clear spatial patterns in the dissemination of political yard signs. Fourth, we turn to spatial analysis and hierarchical models predicting household-level participation, finding that sign-displaying behavior is also sensitive to the micro-social environment. In the final section, we discuss the implications and directions for future research.

The Study of Context

Substantial debate exists over whether context – defined in terms of social networks, the institutions of adult life, or broader environments – matters in influencing political participation, or whether such findings may be the result of underspecified models (King 1996), self-selection

patterns (Klofstad 2007; Nickerson 2005), or ecological data analysis. And, to the extent such effects do exist, questions remain over whether the mechanism is primarily one of interpersonal communication (e.g., Eulau and Rothenberg 1986; Klofstad 2007), or whether contextual effects are driven by perceptions and information cues emanating from the geographic context (e.g., Burbank 1995, 1997; Tam Cho and Rudolph 2008; Wald, Owen and Hill 1988) – this tension has been noted for decades (e.g., Djupe and Gilbert 2009; Huckfeldt and Sprague 1995), and has roots in Burt's (1987) and other sociologists' notions of cohesion versus structural equivalence.

Scholars examining “social context” first looked at the distribution of opinions and behaviors in spatial contexts such as counties (Putnam 1966) and neighborhoods (Huckfeldt 1984; 1986). Later, as many scholars studying behavior began to define “context” in terms of interpersonal networks (e.g., Huckfeldt and Sprague 1995), sociological influences (e.g., Granovetter 1973) drove the recognition that citizens are nested in multiple, competing contexts (Huckfeldt et al. 1995; MacKuen and Brown 1987). There is evidence that individuals are aware of objective conditions in their spatial context (Baybeck and McClurg 2004; see also Djupe and Gilbert 2009), and that such perceptions can influence both perceptions and behavior (Baybeck and McClurg 2004; Burbank 1997).

However, despite this legacy of work, the geographic meaning of context is still quite amorphous, and data limitations are a major impediment to the fruitful arbitration between such explanations. At the level of the interpersonal network, the defining of boundaries has always been of concern (e.g., Knoke and Yang 2008). Where does the social context begin and end, and how can we effectively measure full networks in the mass public?

The study of context has often relied on survey research data, which while useful in unpacking the perceptual bases of informational mechanisms, suffers from a number of problems,

the most important of which might be called the geographic “coverage” problem. Prominent contextual surveys have not sought to interview all individuals within a geographic context, or even a reasonably large percentage thereof. Having small numbers of individual observations per geographic area renders hierarchical estimates extremely imprecise and spatial analyses impossible. Conversely, many recent studies incorporating spatial data analysis into the study of political participation have profited from perfect or near-perfect coverage of the places under study. However, these studies have, by necessity, relied on data collected at higher levels of aggregation (e.g., Tam Cho 2003; Gimpel, Lee and Kaminski 2006; McDaniel 2007; Tam Cho and Gimpel 2010), so that the unit of analysis is not a person or household, but rather a zip-code, electoral precinct, or other similar area.

Ideally, the solution to this problem is to collect data at the individual level for a large number of individuals per areal unit, and to aggregate and merge such information with data regarding the areal units. Indeed, one recent study of such “complete data” (in this case, voter rolls) finds that household-level “context” explains more of the variance in voter turnout than the neighborhood context (Cutts and Fieldhouse 2009).

However, voter *turnout* is perhaps the least promising place to look for such contextual effects, given the surfeit of non-contextual explanations of turnout. Unfortunately, alternatives are not immediately promising: collecting data on vote *choice* is limited by the secret ballot; most other forms of political participation are not observable at the individual level. On the other hand, undertaking a survey to satisfy the above criteria would present massive costs and challenges: determining the population of the sample space in question, disseminating surveys to that population, obtaining a high enough response rate to obtain high ‘coverage,’ not to mention more banal but highly relevant concerns such as behavioral misreporting.

Yard Signs and Contextual Effects

Instead, we focus on the act of displaying a yard sign, an act of political participation which can be observed at a disaggregated level, without concerns over spatial coverage or extravagant costs.¹ While political yard signs fit the type of information cue that purportedly underlies the information-perception mechanism discussed above, the display of such signs is undoubtedly a form of political participation in and of itself. While recent studies have investigated the effectiveness of different forms of voter mobilization (Green and Gerber 2004; 2008), including election-day street signs (Panagopolous 2009), yard signs have received comparatively little attention (but see Laband et al. 2009).

Substantively, we argue that the study of yard signs is important because it is an individual-level (or at least as conceptualized in this study, a household-level) act, but one that has aggregate consequences (Huckfeldt and Sprague 1992). Compared to voting, contributing money, or even campaign volunteering or rally attendance, yard signs are quintessentially *public* acts of political participation. As a tool of party mobilization, such instruments may convey political expectations to all residing in or passing through a space, and may produce further displays of political information (or counter-displays). We therefore believe it highly likely that a household's decision to display a sign will be highly influenced by contextual information: the question remains, what level of context?

In order to gauge the effects of various levels of context on this form of participation, we first consider the possibility that the decision to participate in this manner will be influenced by a broad context, in which the cumulative impact of informational cues (here: signs) impacts

¹ We might conceive of the displaying of yard signs as one of a broader class of acts of 'symbolic participation,' including wearing campaign buttons and displaying campaign bumper stickers. However, we chose to focus on yard signs due to their fixed location.

household-level decisions. That is, the presence of yard signs in a neighborhood generally will signal to others that such displays are socially acceptable.² More specifically, such information cues may signal that displaying signs for a specific candidate is socially desirable or unacceptable. Finally, such patterns may result from strategic decisions to target a neighborhood by political parties or grassroots activists. These meso-contextual effects can be captured by the following two hypotheses:

H1: A block will be more likely to feature yard sign displays, all else equal, when surrounding blocks feature a larger number of yard sign displays.

H2: A block will be more likely to feature yard sign displays for a given presidential candidate, all else equal, when surrounding blocks feature a larger number of yard sign displays for that presidential candidate.³

Next, we consider the possibility that individuals' participatory decisions will be influenced by their immediate geographic context: their closest neighbors. At this level, we believe that both a "solidarity" mechanism and a "dissent" mechanism may be operational. That is, individuals whose property is surrounded by sign-displaying properties may feel implicit or explicit social pressure to display one themselves. Conversely, being surrounded by properties displaying a sign for the opposition candidate may lead one to express their support for their own preferred candidate. The claim that spatial patterns in yard sign displays are driven mostly by a micro-social process is captured in the following two hypotheses:

H3: A household will be more likely to display a yard sign for their preferred presidential candidate, all else equal, when immediate neighbors display a sign for the same candidate.

² In some neighborhoods and developments, yard sign displays are forbidden by rule or custom. To the best of our knowledge, all such developments were excluded from our study at the sampling stage. Certain individuals may also be forbidden from displaying yard signs due to professional regulations—such data was ultimately unobtainable.

³ We believe it unlikely that the opposite effect (i.e. individuals displaying a yard sign to indicate dissent from the neighborhood majority) would operate at this level of context, but rather, would occur at the micro-social context. Data analyses, including some not reported here, support this conclusion. Moreover, since in some neighborhoods most signs displayed related to the presidential race, testing such "solidarity" and "dissent" hypotheses simultaneously would be observationally equivalent to testing Hypothesis 1.

H4: A household will be more likely to display a yard sign for their preferred presidential candidate, all else equal, when immediate neighbors display a sign for the opposite candidate.

Data and Methods: The 2008 Franklin County Neighborhoods and Elections Study

In order to assess the preceding hypotheses, we draw on data from a study designed and conducted by the authors in the late summer and fall of 2008, consisting of a two-wave, observational study of yard sign displays in a random sample of precincts in Franklin County, Ohio (home of the state capital, Columbus), as well as the entire city of Upper Arlington, Ohio.⁴ During the general election period, we observed the posting of political signs in these sixty-four Franklin County precincts by driving block-by-block during two weekends: immediately following the Republican National Convention (September 4-6), and one week prior to Election Day (October 24-27).⁶

To arrive at a sample of households that would be both representative and amenable to data requirements discussed previously, we sampled thirty election precincts (out of 854 county-wide) based on a stratified random sampling procedure.⁷ In addition to varying on the stratification variable (Kerry vote in 2004), our precincts were drawn from various parts of Columbus proper and

⁴ Upper Arlington is a close-in suburb of Columbus with a population of approximately 34,000, and was chosen as a subject for a case study not due to its representativeness (it is upper income and lacks any racial diversity), but due to its self-apparently high level of democratic participation. Upper Arlington has long had an active local Republican party, but is politically competitive, and Democratic participation has been bolstered in the last four years by the creation of Upper Arlington Progressive Action, a grassroots organization that has been active in the last two presidential campaigns. At more than half of the Upper Arlington homes that posted a sign supporting Barack Obama, at least one of these signs was a sign distributed by UAPA. In addition to its turnout rate of well over 80%, Upper Arlington was festooned with political yard signs (with over 2,700 out of 11,500 housing units having at least one).

⁶ In a second component of the FCNES, surveys were sent to residences at which we observed presidential signs (the survey was sent to addresses in both the county-wide study, and the Upper Arlington study).

⁷ Sampling of precincts was based on the 2006 Ohio Colleges exit poll, which used stratified systematic probability-proportional-to-size (PPS) sampling to generate a representative sample of voters. Polling places were divided into five strata based on percentage of 2004 presidential vote for John Kerry. Systematic PPS sampling was used to identify polling places within strata, and after matching these polling locations with the precincts from which they draw, we sampled precincts within polling locations.

many of its suburbs, and included a wide range of demographics, including three majority-Black precincts.

Using appropriate substitution procedures, we then made replacements according to a number of geographic considerations. First, because our main goal was to study spatial patterns of yard signs in neighborhoods, we excluded precincts that are not “compact,” to ensure that a given precinct did not cover terribly disparate areas. Specifically, we excluded precincts whose residential regions did not fit within a one square mile box.⁸ Second, because our inferences are dependent on the ability to observe the posting of political symbols and to correctly identify the household posting them, we excluded precincts with large percentages of apartment housing.⁹ Figure 1 illustrates the locations of the sampled precincts within Franklin County.

****INSERT FIGURE 1 ABOUT HERE****

This observational data was then merged with three sets of publicly-available data. First, block-level data from the 2000 Census was aggregated to the precinct level to measure the demographic characteristics of each precinct. Second, the official voter file from the Franklin County Board of Elections identifies each registered voter and their place of residence, giving us a record of the registered voters associated with each location in our observational data.¹⁰ Third, the above data was merged into a geographic information system (GIS) based on shapefiles provided by the office of the Franklin County Auditor and United States Census Bureau. This allows us to

⁸ Because many of the rural/exurban regions of Franklin County are “unincorporated” and are located within oddly-shaped voting precincts, our sample is not fully representative of this aspect of Franklin County demographics.

⁹ Specifically, we excluded precincts in which there were not at least 200 units of single-family housing, or other housing units (i.e. duplexes, townhouses) where a yard sign-address match was not reasonably feasible. We also excluded apartments and other similar residential units from the precincts which *are* included in the sample.

¹⁰ Public voter files are often known for having problems such as a failure to purge voters from the rolls or update the addresses of voters who have moved. A number of steps were taken to maximize the accuracy of the dataset, including comparisons with property records and phone directories. In most of the remaining flagged cases, the voters in question voted infrequently or not at all. Since the data analyses that follow treat households with no registered voters and households with perennial abstainers largely equally, our concerns regarding measurement error are minimal.

associate the Census and sign data with a spatial location, which is necessary to assess the spatial dependence hypothesized in the previous section.

Overall, data was collected for more than 25,000 properties in more than 900 Census blocks.¹¹ At least one political yard sign was observed at 19.0% of all properties in the sample, including 7.6% of houses displaying signs for Barack Obama and 5.2% displaying signs for John McCain. During the first wave, 5.3% of properties displayed any sign, 2.6% of properties displayed an Obama sign and 0.8% displayed a McCain sign.¹²

Overall, precincts in our sample differed immensely in the level of yard displays observed, ranging from neighborhoods nearly devoid of political content (e.g. Franklinton Precinct 1009A) to neighborhoods covered in signs (e.g. North Clintonville Precinct 1021E). Table 1 summarizes the percentage of properties in each precinct displaying any political yard sign, and the percentage displaying Obama and McCain signs, respectively. Table 2 provides a list of the next twenty most frequent signs observed in the study -- these included candidates for Congress, the state legislature, local office, and ballot issues.

****INSERT TABLES 1 AND 2 ABOUT HERE****

Block Level Analysis

¹¹ The original number of Census blocks was somewhat larger. However, many Census blocks were excluded on the basis that no qualifying properties fell within them (or in some cases, the official Census population count for the block was zero). In addition, we merged Census blocks with neighboring blocks (in both the numerical data and the GIS shapefiles) when the number of properties in the block fell below ten. Since our ultimate dependent variables are framed as percentages of properties displaying signs, this step was a preliminary effort to reduce heteroskedasticity.

¹² One potential problem with collecting observational data of yard signs is that the frequent theft of such signs creates error. To account for this, we took additional steps, including obtaining police reports documenting such thefts and supplementing our data as necessary. We also analyzed the data under the assumption that households who displayed signs during the first wave, but not during the second wave, were victims of theft (except for the small number of individuals who moved during this period, which was also documented). There was no evidence, either in the property-level data, or in the survey data, that these households differed from other households in the dataset.

We begin by assessing Hypotheses 1 and 2, which argue that the prevalence of political yard signs on a given block should be positively associated with the prevalence of yard signs in neighboring blocks. We begin by presenting “naïve” non-spatial OLS models that seek to explain the percentage of households displaying yard signs in each Census block. Next we perform exploratory spatial data analysis techniques to assess whether there is *prima facie* evidence of spatial dependence operating at this level of context. Finally, we analyze multivariate spatial models that assess patterns of spatial dependence while also controlling for demographic and behavioral factors.

The unit of analysis in these models is a block as defined by the Census Bureau, which is often equivalent to “one city block” and on average contains approximately 28 properties. For the purpose of the analyses that follow, data collected from the Franklin County Board of Elections was aggregated to the household level, and then, treating each household as a single unit, re-aggregated to the block level. We argue that the household aggregation strategy is appropriate because the decision to display a yard sign is ultimately made at the household level, not the individual level; a household consisting of two passionate partisans is probably not twice as likely to display a yard sign as a household with one passionate partisan.¹³ Table A in the appendix provides some descriptive statistics at the block level regarding demographics and rates of participation.

Naïve Estimates

To explain the presence of yard signs in general, and of signs for Barack Obama and John McCain in particular, we begin by conducting a series of “naïve” (i.e. non-spatial) regressions to explain yard sign displays as a function of participation, partisanship, and basic demographics. Since the Franklin County sample is a random sample, and the Upper Arlington sample is decidedly

¹³ While we do not directly model the intra-household dynamics that might lead to or inhibit the decision to display signs, we find surprisingly weak evidence regarding intra-household heterogeneity. Specifically, while most houses consist of like-minded individuals, the presence of dissenting voters within the household (measured via primary voting participation) does not seem to exhibit a “veto point” over the decision to display a sign.

unrepresentative, we model the two datasets separately for each of three dependent variables: the percentage of households displaying *any* political yard sign, the percentage displaying an Obama sign, and the percentage displaying a McCain sign. The maps in Figures 2 and 3 display the distribution of each of these variables across the blocks included in the study.

****INSERT FIGURES 2 AND 3 ABOUT HERE****

We include a number of block-level explanatory variables in the model. The variables **percent African-American**, **average age**, **logged per capita income**, and **average educational attainment** are included as key demographic controls. The variable **election history** indicates the average level of election participation among registered voters in the Census block, and the variable **average years registered** indicates how long voters in the Census block have been registered to vote in Ohio. This variable may serve as a crude proxy for residential mobility: previous studies have found that political participation is higher among those who have lived longer at their current location (e.g., Wolfinger and Rosenstone 1980; Highton 2000), and this effect may be even greater for the very public act of displaying a yard sign than it would be for the private act of voting.

We also include a variable, **average traffic volume**, to measure the volume of traffic on a given block. While some have treated the decision to display a yard sign as a purely “expressive” act (Laband et al. 2009), results from the survey component of the FCNES indicate that the decision to display a yard sign may be “strategic” in the minds of participants (Makse and Sokhey 2009). And, even if individual voters are not strategic, party activists (and party organizations more generally), who play a major role in the dissemination of yard signs, are certainly cognizant of the need to display signs at highly visible locations.¹⁴ Details regarding the coding of this variable can be found

¹⁴ While the dissemination of yard signs is often seen as a “top-down” form of mobilization driven by parties, our survey results indicate that the display of presidential yard signs, at least in 2008, was largely driven by individual initiative and social networking. When asked whether they “sought out the sign themselves,” 84% of individuals responded yes. Of

in the Appendix. For this analysis, this variable is aggregated from the household level to the block level.

Finally, we include a measure of partisanship, **GOP primary participation** – an indispensable predictor of Obama and McCain sign patterns. Since election returns are not available at the Census block level, we use the percentage of primary voters who voted in the Republican primary as a proxy for the block-level partisan composition. While the absolute values of this variable overstate Democratic partisanship due to the larger number of meaningful Democratic primaries between 2000-2008, the relative values of this variable are highly correlated ($r > .97$) with precinct-level voting patterns throughout Franklin County.

Results of these regressions can be found in Table 3. To account for the fact that education and income levels are measured at the block group level (the next highest level of analysis in the Census hierarchy) rather than the block level--the Census does not provide these variables at the block level--we use clustered standard errors by block group to account for the possibility of shared variability among these subsets of cases.

****INSERT TABLE 3 ABOUT HERE****

Previous voting history is the largest predictor of yard sign prevalence in both the Franklin County random sample (hereafter, FC), and the Upper Arlington case study (hereafter, UA). However, it is worth noting that this effect is largest for the “any sign” models, smaller for the Obama models, and fades in the McCain models, particularly in the FC sample. Education follows a similar pattern.

these individuals, 45% received the sign from “someone they knew” and 35% purchased the sign or made a donation in exchange for the sign. Thus, it seems that party mobilization efforts played a relative minor role in the dissemination of yard signs, at least in this particular contest.

The **GOP primary participation** variable acts exactly as expected, with Republican Census blocks being more likely to display McCain signs, and less likely to display Obama signs (or signs in general).¹⁵ Other variables in the model demonstrate less consistent patterns. The volume of traffic in a Census block is positively associated with the propensity to display any sign, but is a less powerful predictor in the presidential candidate models. This may indicate that local, less-funded candidates may target households more strategically to get signs displayed at highly visible locations.

Investigating Spatial Dependence

Next, we consider whether patterns of spatial dependence exist among the yard signs observed in Census blocks. Table 4 presents spatial autocorrelation diagnostics, as well as estimates from spatial lag models predicting the same three dependent variables (the percentage of properties in a Census block displaying any sign, the percentage of properties displaying an Obama sign, and the percentage of properties displaying a McCain sign). As in the previous analysis, we model the two samples – FC and UA – separately.

INSERT TABLE 4 ABOUT HERE

The bottom row of Table 4 presents Moran’s I statistics for each of the six analyses. The Moran’s I statistic tests the global linear association between a set of values and the spatially weighted average of those values (Moran 1948; Cliff and Ord 1971, 1981; Anselin 1996; Anselin and Bera 1998). This coefficient of association indicates the type and magnitude of the spatial relationship between an observation and geographically proximate observations as defined by a spatial weights matrix.¹⁶ A positive coefficient signifies that near observations tend to be similar while

¹⁵ This last pattern makes sense due to the dominance of the Democratic Party in local races, and the generally pro-Democratic political environment.

¹⁶ Spatial weights are produced using a spatial weights matrix. A spatial weights matrix is an n by n matrix where elements indicate whether or not observations are geographic neighbors. The matrix is generally then row-standardized

a negative coefficient signifies that near observations tend to be different. Monte Carlo simulations are used to test the significance of the statistic.

For our two datasets, all six statistics are positive and statistically significant, indicating the presence of positive spatial autocorrelation – that is, within each sample and for each dependent variable, we find that neighboring units share similar values on percentages of yard signs. Though not necessarily obvious to the naked eye, there are spatial clustering processes occurring in both the Franklin County and Upper Arlington samples—that is, there are neighborhoods of both political yard signs generally and neighborhoods of yard signs advertising a specific candidate.

However, the Moran’s I statistics tell us nothing about the underlying cause of the spatial autocorrelation nor do they eliminate the possibility that it is an artifact of some non-spatial process. To ensure the former and test the later, we turn to both theory and multivariate models (Florax and de Graff 2004). Accordingly, we re-estimate the “naïve” models from table 3 using spatial lag models to substantively test and account for presence of spatial autocorrelation.¹⁷

In a manner similar to a distributed lag model for serially autocorrelated data, spatial lag models include a spatially lagged dependent variable (ρ) as a regressor on the right-hand side of the equation. (In the presence of spatial autocorrelation, models that fail to estimate ρ suffer from omitted variable bias.) However, unlike a distributed lag model, the lagged regressor in a spatial lag model remains correlated with the error term. This problem with the error-variance structure is

to compute Moran’s I statistics and for modeling in spatial regressions. Row-standardization results in a smoothing of neighboring values I (Anselin and Bera 1998). We use a queen first-order spatial weights matrix where blocks that share any border space are treated as neighbors. Specifications with alternative spatial weights matrices produced similar results.

¹⁷ Spatial regressions were carried out using the “spdep” package in R (Bivand 2009) and spatial weights matrices were produced using GeoDa (Anselin 2004). We use a queen first-order spatial weights matrix where blocks that share any border space are treated as neighbors. Specifications with alternative spatial weights matrices produced substantially similar results.

overcome by estimating the model in a maximum likelihood framework with a likelihood function derived from a joint normal density for the errors (Anselin 1988; Anselin and Bera 1998).

Across the three dependent variables and two samples, the results are largely similar to those discussed previously. The **GOP primary participation** measure indicates that Republican Census blocks are less likely to display Obama signs. **Traffic volume** remains positive and significant, but again, is a less powerful predictor in the presidential candidate models. The spatial parameter *rho* is significant in all three FC models, while it is significant only in the UA model for the percentage displaying any sign, and approaches significance ($p < .11$) for the percentage displaying a McCain sign. *Rho* is not significant in the UA sample in the model predicting the percentage of Obama signs.

Because *rho* is estimated out of a theoretical model that explicitly predicts a role for spatially autoregressive processes it can be interpreted in a manner similar to the interpretation of a Moran's I statistic.¹⁸ In our models, *rho* indicates a substantive spatial relationship between census blocks where groups of actors appear to be responding the political behaviors of spatially proximate groups of actors. Moreover, the positive direction of the *rho* parameters supports Hypothesis 1 and Hypothesis 2: blocks are more likely to be populated with political yard signs when surrounding blocks are populated with political yard signs, and blocks are more likely to be populated with the signs of a particular candidate when surrounding blocks are populated with signs of that candidate.

Turning to model fit, all four of the spatial lag models with significant values of *rho* also have lower Akaike's Information Criterion (AIC) statistics than the corresponding naïve models. In each case, the improvement in the AIC is greater than 2.0, indicating that the spatial lag models are significant improvements over the non-spatial models.

¹⁸ A theoretical estimation of *rho* can be contrasted with a model that estimates *rho* to deal with problems associated with measurement mismatch. Under these conditions, *rho* has the effect of "filtering the dependent variable of spatial autocorrelation" (Anselin and Bera 1998: 247-248).

In seeking to understand why the spatial lag specifications improve model fit consistently in the FC sample, but not in the UA sample, we hasten to point out that Upper Arlington is neither a random sample nor in the mainstream of participatory patterns. Perhaps in the presence of such extremely high levels of political engagement, patterns of spatial contagion could only be detected in panel data: in a cross-section at the point of saturation, such spatial patterns may no longer be apparent.

Property Level Analysis

Having found evidence of spatial autocorrelation in the display of yard signs at the Census block level, and having modeled this diffusion process through a spatial lag, in our final set of analyses we turn our attention to individual households. Thus far we have seen relationships between areas with Obama, McCain, and any type of yard signs, but what factors explain whether a particular property displays a sign? Table 5 provides descriptive statistics for the approximately 25,000 properties in the FCNES study: over a quarter of the properties in Upper Arlington (UA) displayed some type of yard sign; just under 15% of properties in the FC precincts did the same.

****INSERT TABLE 5 ABOUT HERE****

A quick glance at Table 5 provides some basic answers to the question posed – properties at which residents have a higher history of turnout display yard signs in greater numbers; the same is true for primary participation history (see the notes in Appendix Table A for more on how these measures were created). We also examine the partisanship of household members by examining participation in Democratic and Republican primaries. Unsurprisingly, households in which all primary participation was in one party's primary (**homogeneous**) were more likely to post a sign for that party's candidate. However, in households where some members of the household voted in

each party's primary (**heterogeneous**), the dominant party of the household was still almost as likely to post a sign for that party's candidate.¹⁹

We next attempt to gauge whether spatial patterns also exist at the property level. As we did with Census blocks in the previous section, we assess whether spatially more proximate properties are more likely to be similar in terms of sign-displaying behavior than we would otherwise expect them to be. However, in this case our dependent variable is merely whether an individual household displayed any sign, an Obama sign, or a McCain sign. With such binary variables, Moran's I is an inappropriate test of spatial autocorrelation. Instead, we use a join-count statistic which looks individually at each pair of neighbors²⁰ in the dataset and compares the observed number of "matches" (both have a sign of the specified type, or both having no sign) to the expected number of matches based on a spatially random distribution. Thus, for the each variable (Any Sign, McCain Sign, Obama Sign) there are actually two tests: one for neighbors with signs and another for neighbors without signs (Cliff and Ord 1973, 1981; Fortin and Dale 2005). Statistically significant join-count statistics indicate spatial autocorrelation but the statistics themselves are not directly interpretable (Bivand et al. 2008).

Table 6 presents the join-count tests for each of the variables for both of the k -nearest neighbor specifications. In every case, the join-count statistics are positive and significant indicating positive spatial autocorrelation for all three dependent variables. While these tests are exploratory, like our Moran's I results, they imply that households pay attention to their micro-social context

¹⁹ A number of explanations are possible here. First, heterogeneity in primary participation may be somewhat artificial due to cross-over voting, shifting partisan allegiances, former residents that should have been purged from the dataset, or generational factors, i.e. a household composed of two Republican parents and a Democratic child.

²⁰ For this analysis, we use a k -nearest neighbors definition, because the presence of heterogeneous property shapes and sizes means that a contiguity-based measure may be inadequate in identifying a property's neighbors. The analyses that follow test two different spatial weights matrices: one which offers a narrow definition of neighbors ($k=5$) and one which offers a more generous definition ($k=20$).

when deciding to put up a political yard sign. It is worth noting, however, that we observe the starkest differences between actual and expected values with the $k=5$ neighborhood specification—a potential indicator that close neighbors are more important than distant neighbors for each household’s assessment to put up a sign or not.

****INSERT TABLE 6 ABOUT HERE****

To examine the causes of individual participation in a multivariate context, we next present the result from a series of random effects hierarchical models where the household is the unit of analysis, and households are nested within electoral precincts. In Table 7 we present the estimates of six models, again predicting the probability of displaying any political sign, an Obama sign, and a McCain sign in the FC and UA samples . We include a similar battery of explanatory variables to the ones used in the previous models, except variables are now measured at the household level instead of being aggregated to the Census block level. These include the percentage of election participated in by residents between 2000 and 2008 (**election history**), the percentage of Democratic and Republican primaries in which the residents participated (**Democratic primary participation and GOP primary participation**), the **average years registered** of household members, and the **average age** of household members. Finally, as before, we include the **traffic volume** for the property’s location. While we expect properties with more politically active and established residents – i.e., those who have been registered for longer, and those who vote more frequently – to be more likely to display a sign, we also expect displaying a yard sign to be more likely when a property is located in a position of higher visibility. As in the previous analyses, we model UA and FC separately for each dependent variable.

****INSERT TABLE 7 ABOUT HERE****

These models also measure the micro-social environment by indicating the percentage of neighbors that posted political yard signs. In the model predicting the decision to post any sign, we measure the **% neighbors with any sign** among the five nearest properties.²¹ In the model predicting the displaying of yard signs of the two presidential candidates, we include two separate measures indicating the **% of neighbors with Obama signs** and the **% of neighbors with McCain signs**. Finally, we include three Level-2 demographic predictors: **average educational attainment, logged per capita income, and percent African-American**.

Overall, results of the property-level models are largely similar to those of the block-level models. We find that a history of electoral participation is a very strong predictor of displaying a yard sign, and that frequent Democratic and Republican primary participants are more likely to post any sign, and specifically more likely to post a sign for their party's standard-bearer.

Once again, we find that living at a location with a high level of traffic volume makes individuals more likely to post signs in general, and for John McCain in particular, but the effect is not significant in predicting the display of Obama signs. These results suggest that visibility was a determinant of posting for non-presidential races and issues, as well as for McCain supporters – this jells with a story of local, less-funded candidates strategically targeting households, and of McCain supporters trying to signal active pockets of resistance in what were often pro-Democratic political environments.

Younger households are once again more likely to post all types of signs. While it is well-established that younger voters display lower rates of interest and participation (see Kaufmann et al. 2007 for a review), our findings indicate that yard signs might be a type of participatory act that cuts against the literature. Of course, we cannot determine whether this relationship is the result of

²¹ Results were similar when neighbors were defined as k=20.

younger residents being more accessible to party/candidate contacts, or because younger voters simply prefer to express their political views in this way (though survey data collected as part of the FCNES indicates it is likely the latter).

Finally, turning to the micro-social environment, we find that the presence of neighbors who post a yard sign is a significant predictor of whether a household decides to post a yard sign. Looking more specifically at the presidential candidates, we can see that the presence of both same-party *and* opposition candidate signs makes a household more likely to post a sign for their preferred candidate, although the presence of same-party signs is stronger in each case (and in the case of Upper Arlington Obama signs, the coefficient on neighbors with McCain signs falls short of statistical significance). This indicates that among social pressure mechanisms, a norm of conformity or solidarity may be somewhat stronger than the impulse to express dissent. In assessing more generous definitions of what constitutes a neighbor (i.e. $k=10$, $k=20$, etc.) we also find a declining impact, indicating that it is one's most immediate neighbors that have the greatest impact on the decision to post a sign.

Discussion and Conclusion

Observing yard signs is a common experience for most Americans – a form of political communication that they are subject to regardless of personal interest, ability, or consent. Because the displaying of a yard sign is such a public and in some ways confrontational act, we argue that it should be studied in more detail rather than relegated to a few survey questions, or analyzed as part of an index of acts. This study represents one of the first systematic approaches to this topic, and advances on previous efforts (e.g., Huckfeldt and Sprague 1992) by not relying on self-reported behavior.

At the same time, we speak to the growing literature on context in politics, taking the notions of space and political environment seriously and modeling them accordingly. Our findings reaffirm that citizens experience politics at multiple levels (Huckfeldt and Sprague 1995) and suggest that both the interpersonal interaction found in social networks and the broader neighborhood context can both influence whether individuals choose to express their political opinions so publicly.

Our findings also lead us to question the intuition that the clustering of yard signs is a top-down process driven by political party canvassing. Instead, patterns of spatial autocorrelation such as the ones observed in this study may arise from a more organic process, one element of which is the strategic behavior of individuals who are cognizant of their visible property location, and wish to leverage it to communicate their political beliefs. Thus, although we sometimes treat yard sign and bumper sticker displays as expressive forms of participation (Laband et al 2009), we find evidence of an underlying rationality that operates at multiple levels (i.e., both at the Census block, and at the residential property).

With this enhanced understanding of what yard signs can actually tell us, future work should assess the impact of these neighborhood “sign wars” on political behavior, attitudes, and communication. Although the information bombardment that is characteristic of presidential campaigns makes it seemingly implausible that yard signs would have a direct causal effect on turnout or vote choice, we find elsewhere (Makse and Sokhey 2009) that a surprisingly large number of people believe their signs *do* influence votes. More importantly, we might ask whether such displays engender hostility and interrupt the functioning of interpersonal networks (both political and more broadly social ones), or whether the expression of dissenting opinions is seen largely as fair game. Given our broader concerns about polarization in the American electorate, self-selection of information sources in the media, and self-segregation in neighborhoods and social institutions,

understanding the ramifications of this most public form of political expression are of considerable import.

Appendix

Coding of the variable “Traffic volume”

Streets were coded into six categories based on the amount of normal car traffic one would expect (and hence, the strategic visibility of posting a yard sign). The authors separately coded each street in the dataset based on the defining characteristics given below. On a six-point scale (1= dead end; 6 = major artery), the authors identically coded 94.3% of the 1,087 streets in the dataset, and agreed within one point on the scale for 61 of the remaining 62 streets. Disagreements were resolved through discussion and re-examination of the locations.

The codes are as follows:

Dead end (1): As understood colloquially, including cul-de-sacs.

Minor outlet (2): Street is only likely to be used by people living in the neighborhood.

Major outlet (3): Street is a major route into or out of a neighborhood and branches off into many minor outlets and/or dead ends. The street attracts a small volume of traffic from outside the neighborhood, but a high percentage of the traffic within the neighborhood.

Connector (4): Street connects neighborhoods with each other and attracts a significant volume of traffic with origins and destinations outside the neighborhood. Traffic is generally 35 mph, and is controlled by a mix of stop signs and traffic lights.

Main drag (5): Street provides access to major roads and highways, and passes through commercial districts. Speed limit is typically 35 mph (except in commercial districts), and may have two lanes in each direction.

Major artery (6): Street is likely to attract particularly large volumes of traffic and may become congested during commuting hours. Speed limit is typically 45 mph or higher, and usually has two lanes in each direction.

<i>Street Classification</i>			
	<i>All Properties</i>	<i>Columbus Properties</i>	<i>Upper Arlington Properties</i>
Dead end	8.03%	10.32%	5.54%
Minor outlet	50.02%	46.79%	53.51%
Major outlet	31.20%	34.57%	27.55%
Connector	6.33%	5.43%	7.31%
Main drag	3.50%	2.34%	4.77%
Major artery	0.92%	0.55%	1.32%

Appendix Table A: 2008 FCNES – Census Block-Level Descriptive Statistics ^a				
	Mean	Std. Dev	Min.	Max.
<i>Household Characteristics</i>				
<i>Average Years Registered</i> ^b	7.15	0.82	2.2	8.76
<i>Average Age</i>	51.75	33.41	33.41	81.15
<i>% Participation in All Elections</i> ^c	60.2%	10.2%	7.0%	100%
<i>% Participation in GOP primary</i> ^d	30.9%	16.6%	0.0%	100%
<i>Block Level Demographics</i>				
<i>Percent African-American</i>	7.5%	18.8%	0.0%	100%
<i>Median Age</i>	40.22	8.49	15.7	81.1
<i>Income Per Capita</i> ^e	\$32,137	\$14,839	\$8,328	\$80,215
<i>Educational Attainment</i> ^e (1=Less than HS; 5 = Graduate School)	3.30	0.78	1.48	4.26
N=911 Census blocks				
<p>a All calculations are based on the two most active voters at each address. Similar measures created based on all registered voters at each address are highly correlated ($r > 0.98$) with these measures. Each household is weighted equally, regardless of the number of registered voters, for the purpose of calculating block-level averages.</p> <p>b Due to left-censored records from the Franklin County Board of Elections, all voters registered before 1/1/2000 have a value of 8.76 years on this variable.</p> <p>c Elections considered are general elections in 2000-2008, and primary elections in 2000, 2002, 2004, 2006, and 2008. Only elections occurring since the voter's registration date are counted in the denominator.</p> <p>d Indicates the percentage of times an individual participated in <i>Republican</i> primaries divided by the number of times an individual participated in <i>any</i> primary.</p> <p>e Income and education data are only collected at the block group level. All blocks within a block group are assigned the same value for these two variables.</p>				

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Table 1: The Percentage of Properties Displaying Yard Signs, by Precinct

Map #	Precinct	Any Sign Percentage	Obama Sign Percentage	McCain Sign Percentage	Turnout, 2008	Obama Vote, 2008
1	Columbus Ward 9A	1.9%	0.5%	0.1%	32.5%	69.4%
2	Columbus Ward 10C	6.4%	4.3%	0.0%	44.4%	85.0%
3	Columbus Ward 11D	5.1%	2.0%	1.5%	53.3%	57.3%
4	Columbus Ward 14F	15.8%	9.3%	0.3%	68.2%	79.9%
5	Columbus Ward 19H	27.7%	18.1%	1.3%	74.6%	79.4%
6	Columbus Ward 21E	37.1%	17.1%	6.0%	81.9%	64.3%
7	Columbus Ward 28F	25.1%	18.1%	1.7%	78.6%	78.0%
8	Columbus Ward 32A	13.9%	4.7%	3.8%	77.5%	59.2%
9	Columbus Ward 35C	11.2%	9.2%	0.0%	63.1%	98.9%
10	Columbus Ward 37E	7.7%	2.4%	1.3%	73.8%	47.2%
11	Columbus Ward 49B	7.6%	3.2%	2.1%	62.9%	49.9%
12	Columbus Ward 49D	3.3%	0.8%	1.5%	61.0%	42.4%
13	Columbus Ward 51C	11.4%	10.4%	0.0%	66.9%	93.1%
14	Columbus Ward 52F	10.0%	7.9%	0.6%	66.9%	74.6%
15	Columbus Ward 55D	22.7%	19.0%	0.9%	55.0%	90.1%
16	Columbus Ward 57A	3.6%	1.4%	0.6%	50.3%	63.3%
17	Columbus Ward 63C	24.3%	8.3%	7.2%	82.3%	49.9%
18	Columbus Ward 72B	12.2%	4.6%	6.3%	77.1%	45.0%
19	Columbus Ward 73E	6.5%	4.6%	0.9%	74.4%	59.5%
20	Columbus Ward 77B	10.2%	2.2%	1.8%	71.6%	57.3%
21	Columbus Ward 84E	11.6%	8.3%	2.3%	81.7%	58.3%
22	Bexley Ward 4C	23.5%	12.2%	5.1%	63.1%	70.9%
23	Westerville Ward 1C	12.5%	3.4%	5.4%	80.3%	40.3%
24	Westerville Ward 4A	12.3%	3.4%	5.8%	77.1%	38.7%
25	Groveport Precinct C	15.2%	2.7%	7.4%	71.9%	37.1%
26	Hilliard Ward 2A	24.4%	6.5%	6.3%	82.4%	45.8%
27	Hilliard Ward 2B	25.6%	5.9%	7.5%	79.5%	45.9%
28	Hilliard Ward 4C	22.4%	3.3%	5.7%	78.0%	42.2%
29	Worthington Ward 2A	25.7%	15.4%	6.3%	80.8%	57.8%
30	Reynoldsburg Ward 1B	13.3%	3.7%	5.8%	85.7%	48.5%
31	Upper Arlington (all)	25.7%	9.2%	8.2%	80.2%	47.8%

Source: The 2008 FCNES (compiled from original and publicly available data)

Table 2: Top 20 (non-Presidential) Signs Observed 2008 FCNES Precincts		
<i>Candidate Signs</i>	<i>Total # of Signs</i>	<i>Percentage of properties within relevant jurisdiction</i>
Steve Stivers (R, 15 th Congressional District)	493	2.3%
Tim Rankin (R, OH House District 24)	379	3.0%
<i>Ted Celeste (D, OH House District 24)</i>	372	2.9%
<i>Jim Hughes (R, OH Senate District 6)</i>	356	2.3%
<i>Mary Jo Kilroy (R, 15th Congressional District)</i>	220	1.0%
Danielle Blue (D, OH Senate District 6)	136	0.9%
Lawrence Belskis (R, Probate Court)	97	0.4%
<i>John Carney (D, OH House District 22)</i>	93	6.9%
<i>Richard Cordray (D, Attorney General)</i>	85	0.3%
<i>John O'Grady (D, County Commissioner)</i>	58	0.2%
<i>Paula Brooks (D, County Commissioner)</i>	40	0.2%
<i>Pat Tiberi (R, 12th Congressional District)</i>	37	0.8%
<i>Shawn Dingus (D, Court of Common Pleas)</i>	34	0.1%
David Robinson (D, 12 th Congressional District)	26	0.6%
<i>Ballot Issue and Other Signs</i>		
Anti 51 (Upper Arlington Zoning Ordinance)	211	1.9%
<i>Pro 78 (Hilliard Schools Levy)</i>	158	9.9%
<i>Pro 51 (Upper Arlington Zoning Ordinance)</i>	117	1.0%
Anti War	103	0.4%
<i>Pro 75 (Columbus Schools Levy)</i>	65	0.6%
<i>Anti 6 (Gambling Ballot Initiative)</i>	31	0.1%
Source: 2008 FCNES		
Italics denote successful candidate or ballot issue. "Relevant jurisdiction" means that voters at a given household were eligible to vote for the candidate or ballot issue in question.		

**Table 3: Predicting the % of Properties Displaying Yard Signs
FCNES Census Blocks; OLS Estimates**

<i>Variables</i>	<i>Dependent Variables</i>					
	% displaying any sign		% displaying an Obama sign		% displaying a McCain sign	
	Franklin County	Upper Arlington	Franklin County	Upper Arlington	Franklin County	Upper Arlington
Percent African-American	-0.013 (0.026)	-0.387 (0.374)	0.029 (0.025)	-0.035 (0.253)	-0.014 (0.010)	-0.365 (0.306)
Avg. Traffic Volume	0.013+ (0.008)	0.031** (0.009)	0.016** (0.007)	0.003 (0.005)	-0.005+ (0.003)	-0.000 (0.005)
Per Capita Income (Logged)	-0.012 (0.035)	-0.025 (0.038)	0.016 (0.027)	-0.034* (0.013)	0.002 (0.011)	-0.013 (0.019)
Education	0.095** (0.016)	0.079* (0.029)	0.045** (0.010)	0.063** (0.015)	0.011+ (0.006)	0.027+ (0.015)
Election history	0.390** (0.043)	0.511** (0.096)	0.297** (0.048)	0.324** (0.059)	0.010 (0.026)	0.128* (0.062)
GOP primary participation	-0.177** (0.062)	0.030 (0.043)	-0.255** (0.049)	-0.172** (0.028)	0.075** (0.023)	0.216** (0.032)
Average years registered	0.012 (0.011)	0.029* (0.012)	0.005 (0.013)	0.019* (0.007)	-0.002 (0.003)	-0.004 (0.006)
Average Age	0.000 (0.001)	-0.004** (0.001)	0.001 (0.001)	-0.001 (0.001)	0.000 (0.000)	-0.002* (0.001)
Constant	-0.319 (0.273)	-0.187 (0.338)	-0.444** (0.204)	-0.013 (0.133)	-0.041 (0.087)	0.099 (0.182)
<i>Model Statistics</i>						
# Observations (Blocks)	466	435	466	435	466	435
AIC	-841.03	-694.64	-1087.65	-1166.44	-1653.67	-1133.06
Adjusted R ²	0.451	0.155	0.378	0.157	0.223	0.126

+ p<0.10, * p<0.05, ** p<0.01

Note: standard errors are adjusted for clustering by census block group.

**Table 4: Predicting the % of Properties Displaying Yard Signs
FCNES Census Blocks; Spatial Lag Models^a**

<i>Variables</i>	Dependent Variables					
	% displaying any sign		% displaying an Obama sign		% displaying a McCain sign	
	Franklin County	Upper Arlington	Franklin County	Upper Arlington	Franklin County	Upper Arlington
Percent African-American	-0.014 (0.021)	-0.354 (0.414)	0.020 (0.017)	-0.035 (0.247)	-0.008 (0.009)	-0.352 (0.256)
Avg. Traffic Volume	0.012* (0.007)	0.026** (0.008)	0.013* (0.005)	0.003 (0.005)	-0.003 (0.003)	-0.001 (0.005)
Per Capita Income (Logged)	-0.010 (0.023)	-0.021 (0.023)	0.017 (0.018)	-0.034* (0.014)	-0.001 (0.010)	-0.016 (0.014)
Education	0.065** (0.014)	0.052+ (0.027)	0.034** (0.011)	0.063** (0.017)	0.009 (0.006)	0.024 (0.016)
Election history	0.355** (0.055)	0.470** (0.095)	0.273** (0.044)	0.324** (0.056)	0.015 (0.023)	0.123* (0.058)
GOP primary participation	-0.135** (0.039)	0.022 (0.057)	-0.225** (0.031)	- 0.172** (0.030)	0.068** (0.016)	0.213** (0.035)
Average years registered	0.008 (0.006)	0.023* (0.010)	0.003 (0.004)	0.020** (0.006)	-0.002 (0.003)	-0.004 (0.006)
Average Age	0.001 (0.001)	-0.003* (0.001)	0.001 (0.001)	-0.001 (0.001)	0.001 (0.001)	-0.002** (0.001)
Constant	-0.263 (0.001)	-0.169 (0.219)	-0.400** (0.157)	-0.013 (0.133)	-0.014 (0.084)	0.127 (0.136)
<i>Model Statistics</i>						
# Observations (Blocks)	466	435	466	435	466	435
AIC	-845.85	-707.02	-1098.0	-1162.4	-1674.8	-1131.6
Rho	0.287**	0.284**	0.195**	0.001	0.234**	0.126
LM Test for Residual Autocorrelation	21.506**	0.029	5.052*	0.095	4.031	0.205
Moran's I (DV) [†]	0.532**	0.210**	0.395**	0.091**	0.345**	0.085**

+ p<0.10, * p<0.05, ** p<0.01

[†] Moran's I significance based on 10,000 Monte-Carlo Simulations

^aSpatial regressions were carried out using the "spdep" package in R (Bivand 2009)

Table 5: Property-Level Descriptive Statistics 2008 FCNES			
	<i>Any Sign</i>	<i>Obama Sign</i>	<i>McCain Sign</i>
Columbus sample (N=14,411)	13.6%	6.4%	2.9%
Upper Arlington (N=11,279)	25.7%	9.2%	8.2%
<i>By Total Voting History</i>			
Top Quartile	30.7%	12.7%	8.2%
Second Quartile	24.6%	10.5%	6.3%
Third Quartile	18.0%	6.8%	4.8%
Lowest Quartile	10.6%	2.9%	3.2%
<i>By Primary Participation History</i>			
Top Quartile	30.0%	12.5%	8.0%
Second Quartile	22.7%	9.9%	5.7%
Third Quartile	17.9%	6.6%	5.0%
Lowest Quartile	10.4%	2.7%	3.2%
<i>By Household Composition</i>			
No registered voters in household	3.8%	0.5%	0.5%
One voter household	14.2%	5.5%	3.5%
Homogeneous Democratic	22.7%	14.7%	1.9%
Heterogeneous Democratic	23.6%	12.5%	2.6%
Homogeneous Republican	30.2%	0.8%	18.4%
Heterogeneous Republican	27.2%	1.7%	15.0%
Source: 2008 FCNES (compiled from original and publicly available data)			

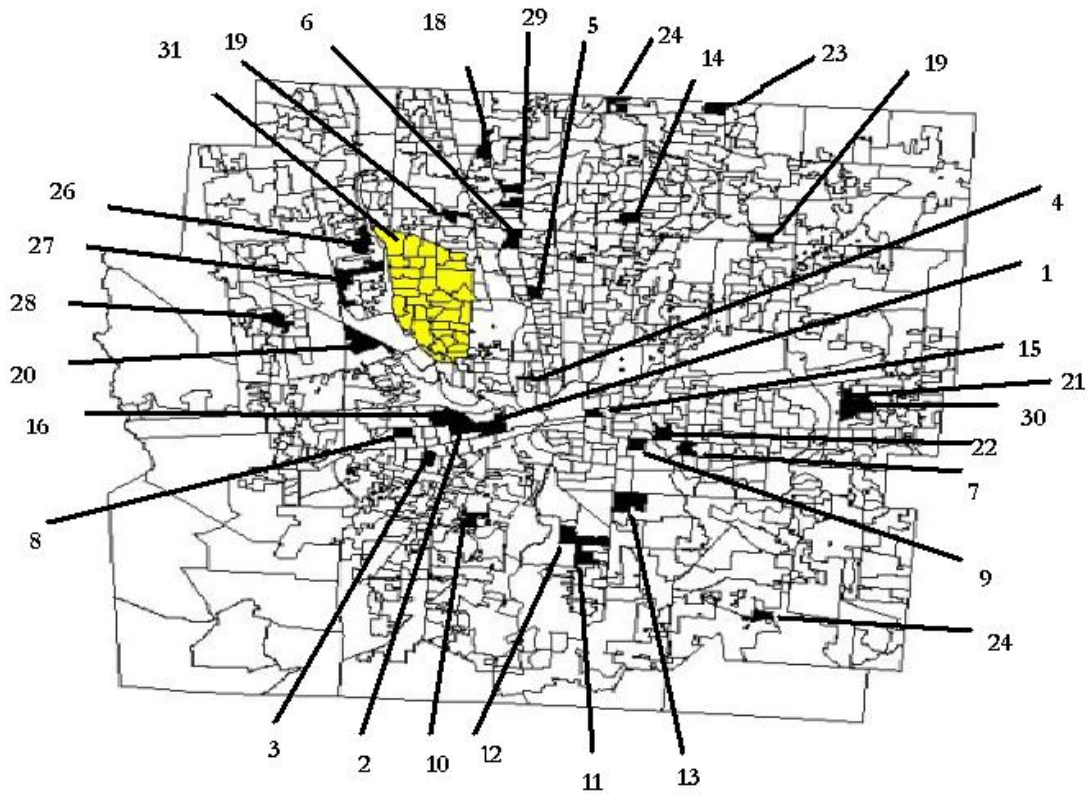
Table 6: Join-Count Statistics

Join-Count Statistics: Franklin County Sample								
Any Sign								
No Sign-Matches					Any Sign-Matches			
	Observed	Expected	Difference	P-Value	Observed	Expected	Difference	P-Value
k=5	6219.2	6110.45	108.75	0.001	263.4	150.92	112.48	0.001
k=20	6189.13	6110.45	78.68	0.001	240.4	150.92	89.48	0.001
Obama Sign								
No Obama Sign-Matches					Obama Sign-Matches			
	Observed	Expected	Difference	P-Value	Observed	Expected	Difference	P-Value
k=5	7317.8	7289.27	28.53	0.001	62.9	25.77	37.13	0.001
k=20	7296.6	7289.27	7.33	0.016	56.43	25.77	30.66	0.001
McCain Sign								
No McCain Sign-Matches					McCain Sign-Matches			
	Observed	Expected	Difference	P-Value	Observed	Expected	Difference	P-Value
k=5	7782.9	7772.75	10.15	0.001	19.4	5.24	14.16	0.001
k=20	7777.70	7772.75	4.95	0.017	14.95	5.24	9.71	0.001

Join-Count Statistics: Upper Arlington Sample								
Any Sign								
No Sign-Matches					Any Sign-Matches			
	Observed	Expected	Difference	P-Value	Observed	Expected	Difference	P-Value
k=5	3180.5	3109.99	70.51	0.001	439	373.49	65.51	0.001
k=20	3155.25	3109.99	45.26	0.001	417.86	373.49	44.37	0.001
Obama Sign								
No Obama Sign-Matches					Obama Sign-Matches			
	Observed	Expected	Difference	P-Value	Observed	Expected	Difference	P-Value
k=5	4658.7	4647.41	11.29	0.003	64.2	47.9	16.3	0.001
k=20	4654.97	4647.41	7.56	0.002	56.58	47.9	8.68	0.001
McCain Sign								
No McCain Sign-Matches					McCain Sign-Matches			
	Observed	Expected	Difference	P-Value	Observed	Expected	Difference	P-Value
k=5	4771.3	4750.56	20.74	0.001	56.9	38.05	18.85	0.001
k=20	4759.18	4750.56	8.62	0.001	51.2	38.05	13.15	0.001

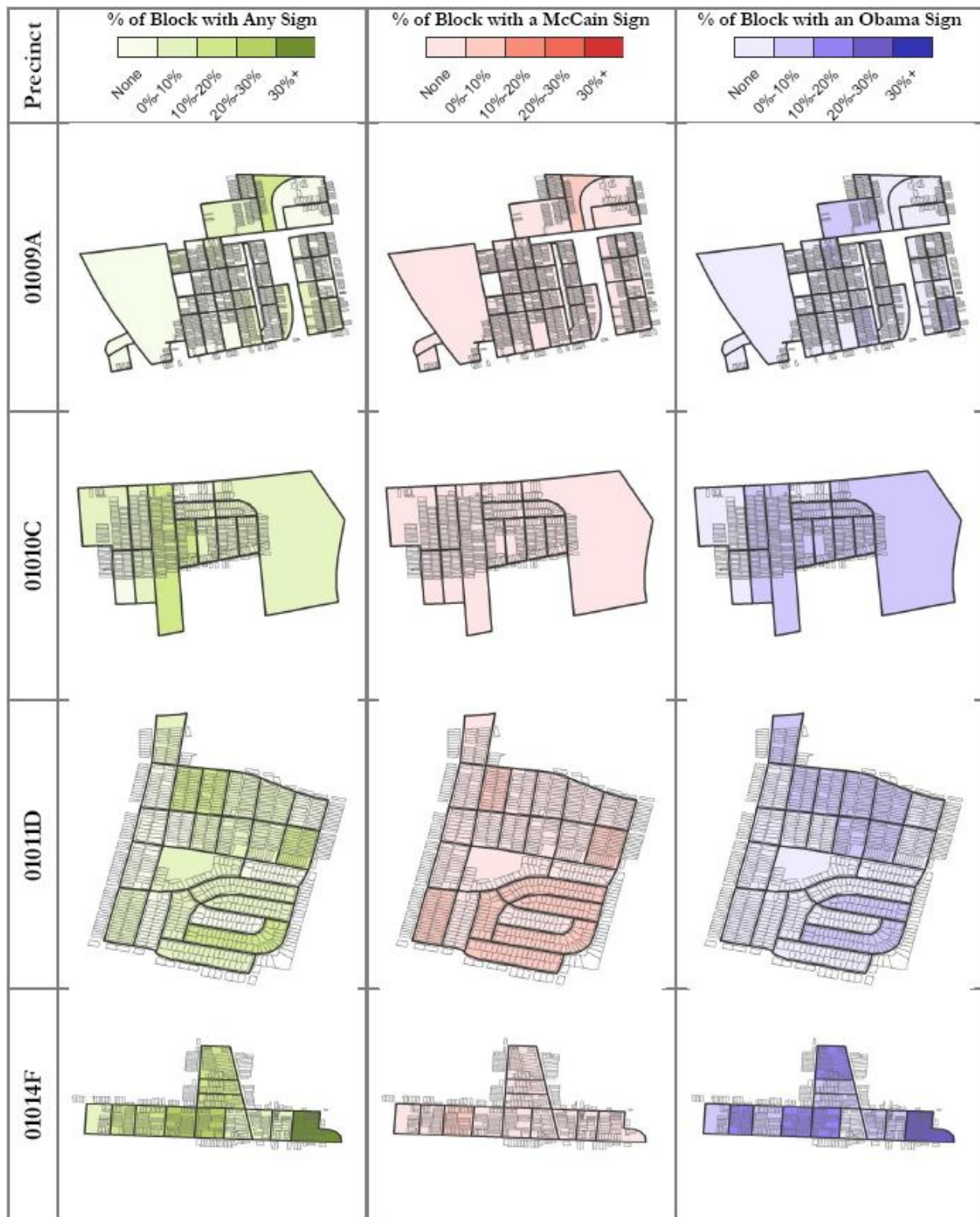
Table 7: Predicting Displaying a Yard Sign: Random Effects Logit Estimates						
	Dependent Variables					
	Displaying Any Sign		Displaying an Obama Sign		% displaying a McCain sign	
	Franklin County	Upper Arlington	Franklin County	Upper Arlington	Franklin County	Upper Arlington
<i>Level 1 Variables</i>						
Constant	-3.305 (1.459)**	-3.237 (1.188)**	-4.198 (2.378)+	-3.719 (1.346)**	-10.411 (2.712)**	-5.349 (1.376)**
Traffic volume	0.079 (0.027)**	0.118 (0.024)**	0.008 (0.041)	0.039 (0.032)	0.146 (0.050)**	0.063 (0.028)*
Election history	1.327 (0.146)**	1.478 (0.153)**	2.129 (0.227)**	2.454 (0.220)**	1.861 (0.303)**	1.664 (0.199)**
GOP primary participation	0.544 (0.152)**	0.208 (0.124)+	-2.913 (0.331)**	-3.617 (0.295)**	0.978 (0.276)**	0.808 (0.190)**
Dem. primary participation	1.065 (0.141)**	0.536 (0.131)**	1.475 (0.191)**	1.951 (0.171)**	-3.035 (0.403)**	-4.328 (0.378)**
% Neighbors with any yard sign	1.636 (0.143)**	1.252 (0.124)**	—	—	—	—
% Neighbors with Obama sign	—	—	1.631 (0.256)**	1.588 (0.311)**	0.846 (0.422)*	0.587 (0.253)*
% Neighbors with McCain sign	—	—	1.149 (0.424)**	0.409 (0.277)	3.323 (0.406)**	2.197 (0.328)**
Average age of household	-0.018 (0.002)**	-0.013 (0.002)**	-0.020 (0.003)**	-0.018 (0.003)**	-0.019 (0.004)**	-0.017 (0.003)**
Average length of voter registration	0.088 (0.011)**	0.059 (0.009)**	0.148 (0.017)**	0.140 (0.017)**	0.126 (0.025)**	0.121 (0.018)**
<i>Level 2 Variables</i>						
Average education	0.533 (0.112)**	0.355 (0.144)**	0.586 (0.184)**	0.640 (0.172)**	0.097 (0.201)	0.436 (0.166)**
Percent African-American	0.449 (0.196)*	-0.252 (1.657)	1.005 (0.279)**	1.129 (2.399)	-2.522 (0.689)**	-4.308 (3.253)
Logged per capita income	-0.146 (0.167)	-0.059 (0.145)	-0.217 (0.276)	-0.289 (0.152)+	0.535 (0.309)+	0.005 (0.155)
<i>Model Statistics</i>						
# Observations	14,409	11,279	14,409	11,279	14,409	11,279
# of Level-2 units	30	34	30	34	30	34
Wald χ^2	815.95**	987.90**	821.26**	1142.40**	490.28**	735.88**
$\sigma(u)$	0.286**	--	0.348**	--	0.311**	--
LR test χ^2 (rho)	38.56**	--	32.69**	--	5.58**	--
+ p<0.10, * p<0.05, ** p<0.01 Random effects did not improve fit of Upper Arlington models; reported findings are logit models with clustered standard errors.						

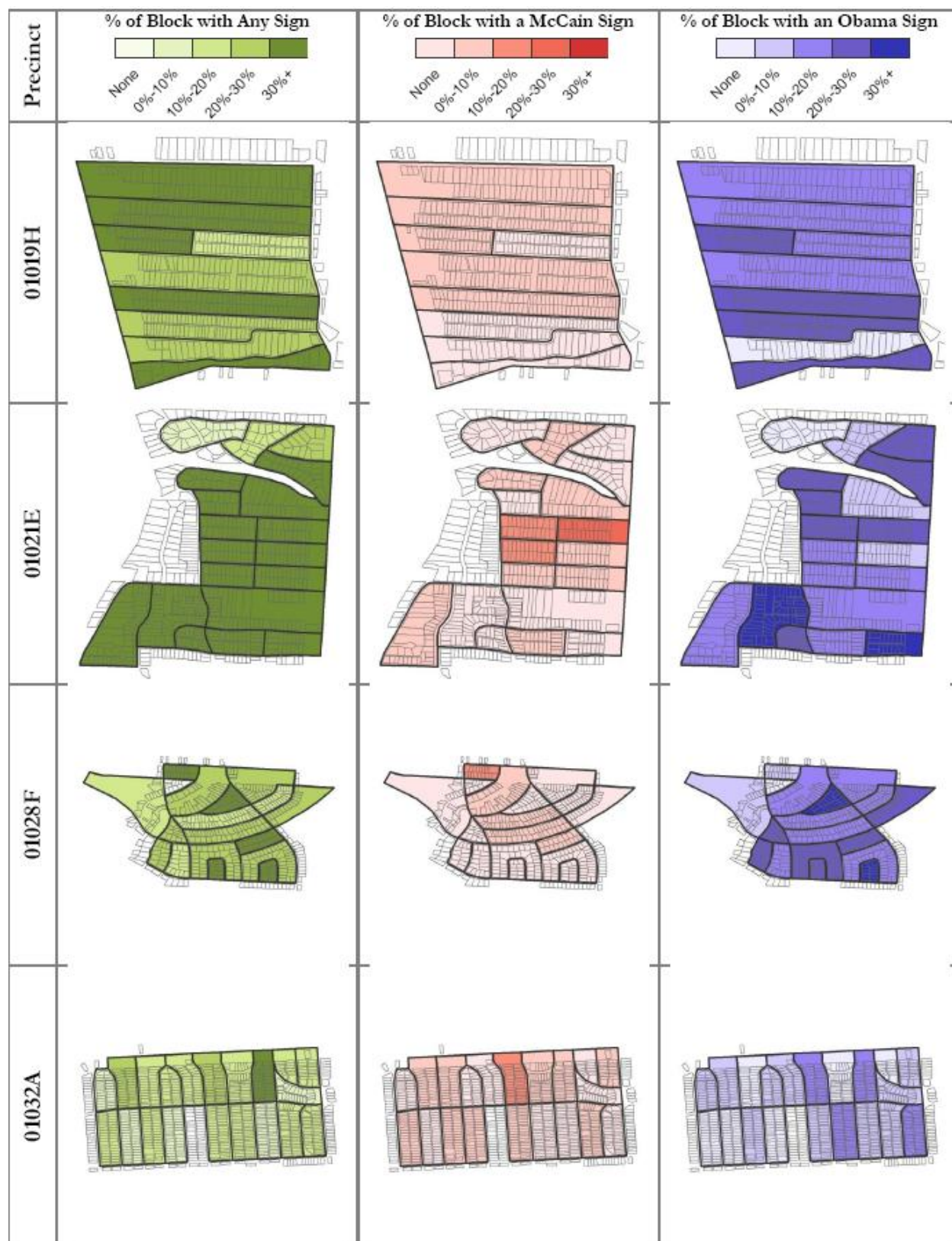
Figure 1: Location of FCNES Precincts in Franklin County

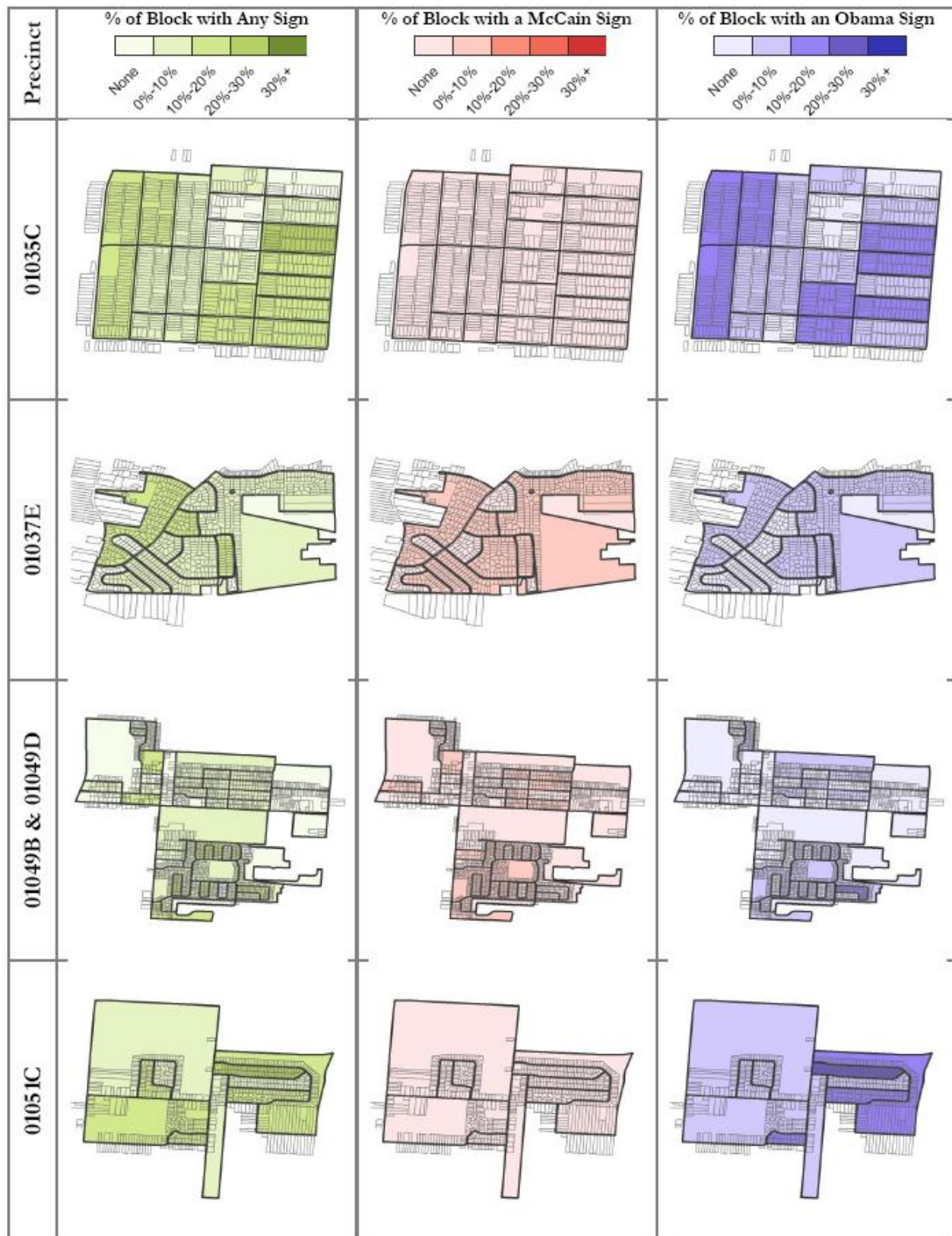


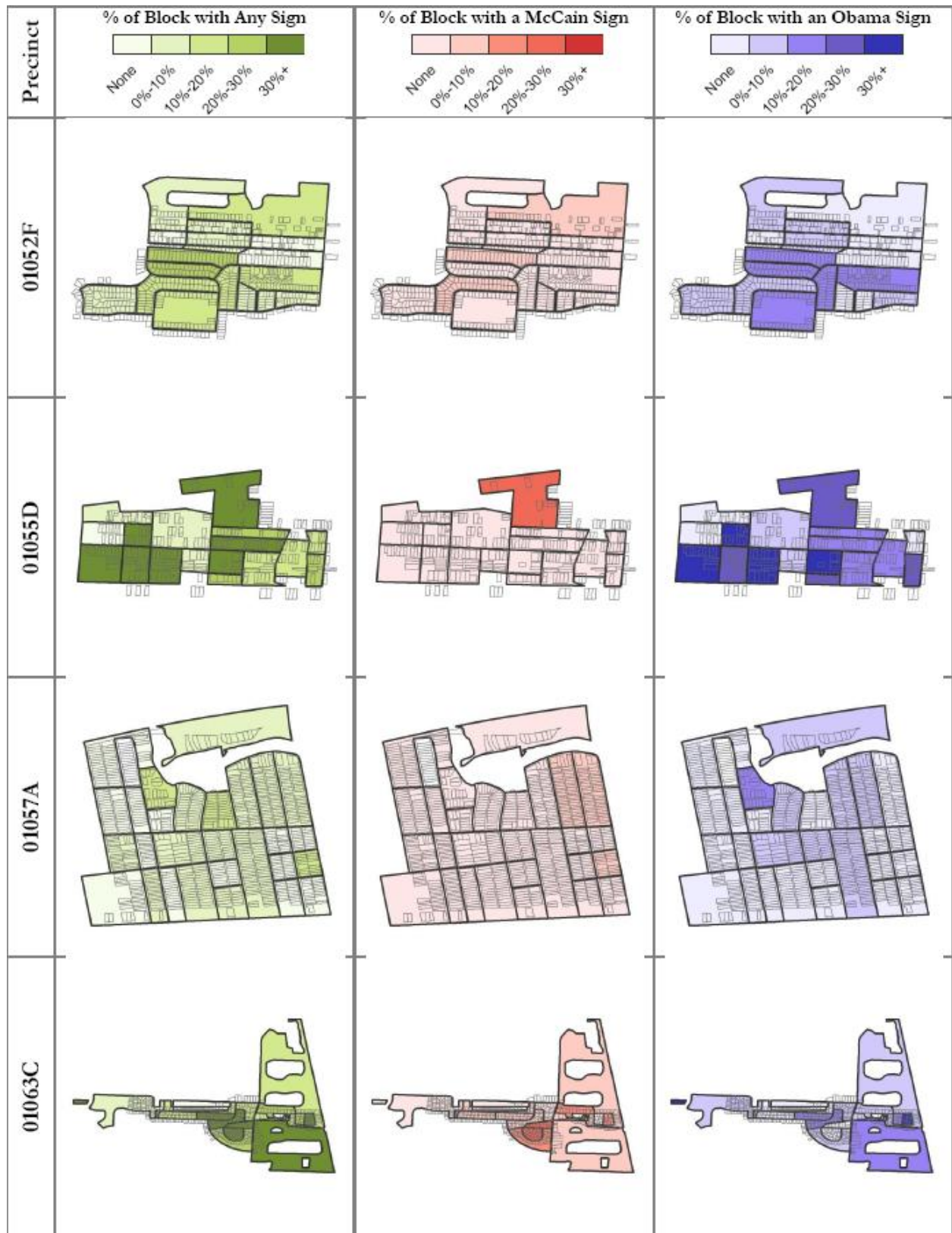
Key: Numbers indicate precinct names.		
1: Columbus Ward 9A	11: Columbus Ward 49B	21: Columbus Ward 84E
2: Columbus Ward 10C	12: Columbus Ward 49D	22: Bexley Ward 4C
3: Columbus Ward 11D	13: Columbus Ward 51C	23: Westerville Ward 1C
4: Columbus Ward 14F	14: Columbus Ward 52F	24: Westerville Ward 4A
5: Columbus Ward 19H	15: Columbus Ward 55D	25: Groveport Precinct C
6: Columbus Ward 21E	16: Columbus Ward 57A	26: Hilliard Ward 2A
7: Columbus Ward 28F	17: Columbus Ward 63C	27: Hilliard Ward 2B
8: Columbus Ward 32A	18: Columbus Ward 72B	28: Hilliard Ward 4C
9: Columbus Ward 35C	19: Columbus Ward 73E	29: Worthington Ward 2A
10: Columbus Ward 37E	20: Columbus Ward 77B	30: Reynoldsburg Ward 1B
		31: Upper Arlington Case Study

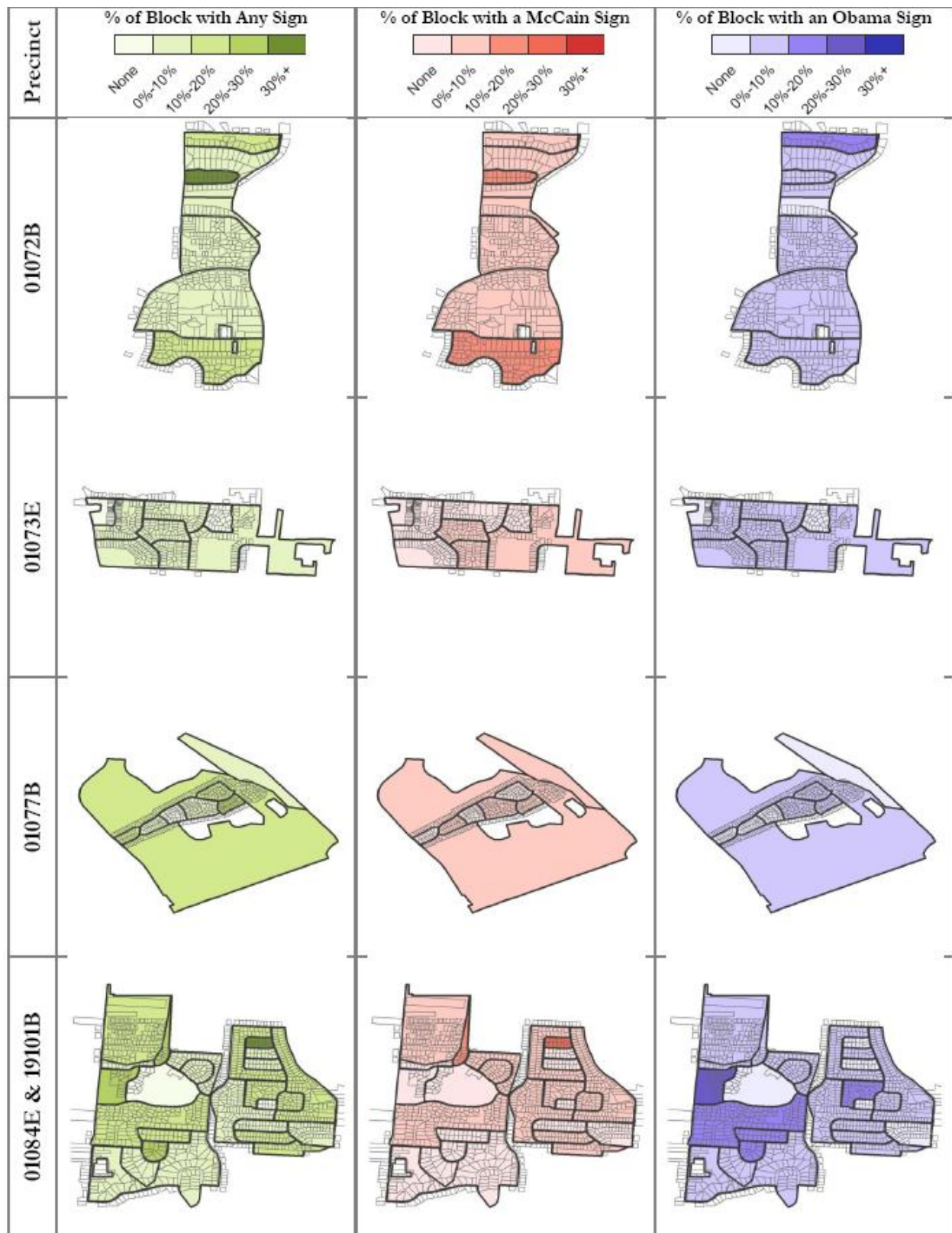
Figure 2: Franklin County Maps

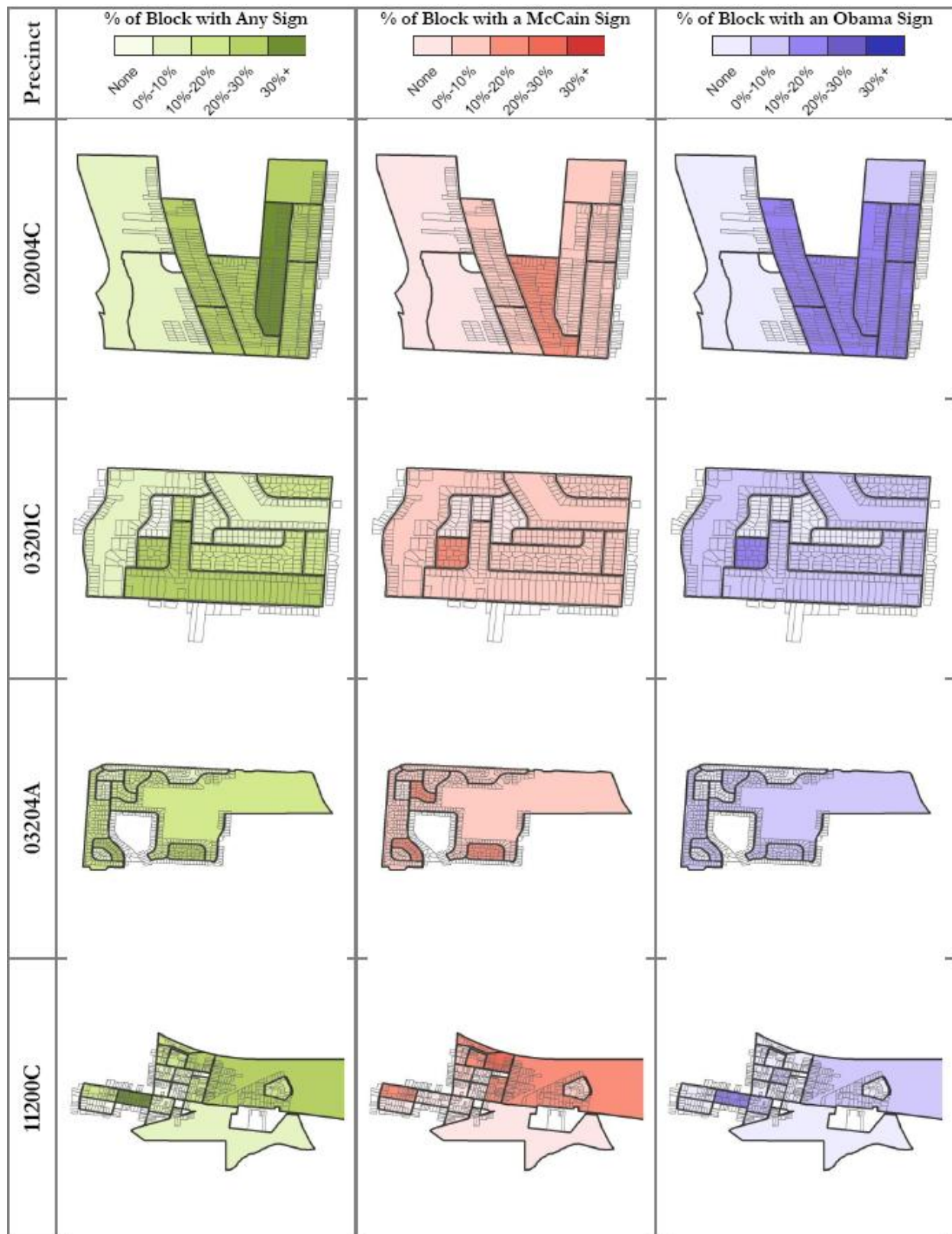












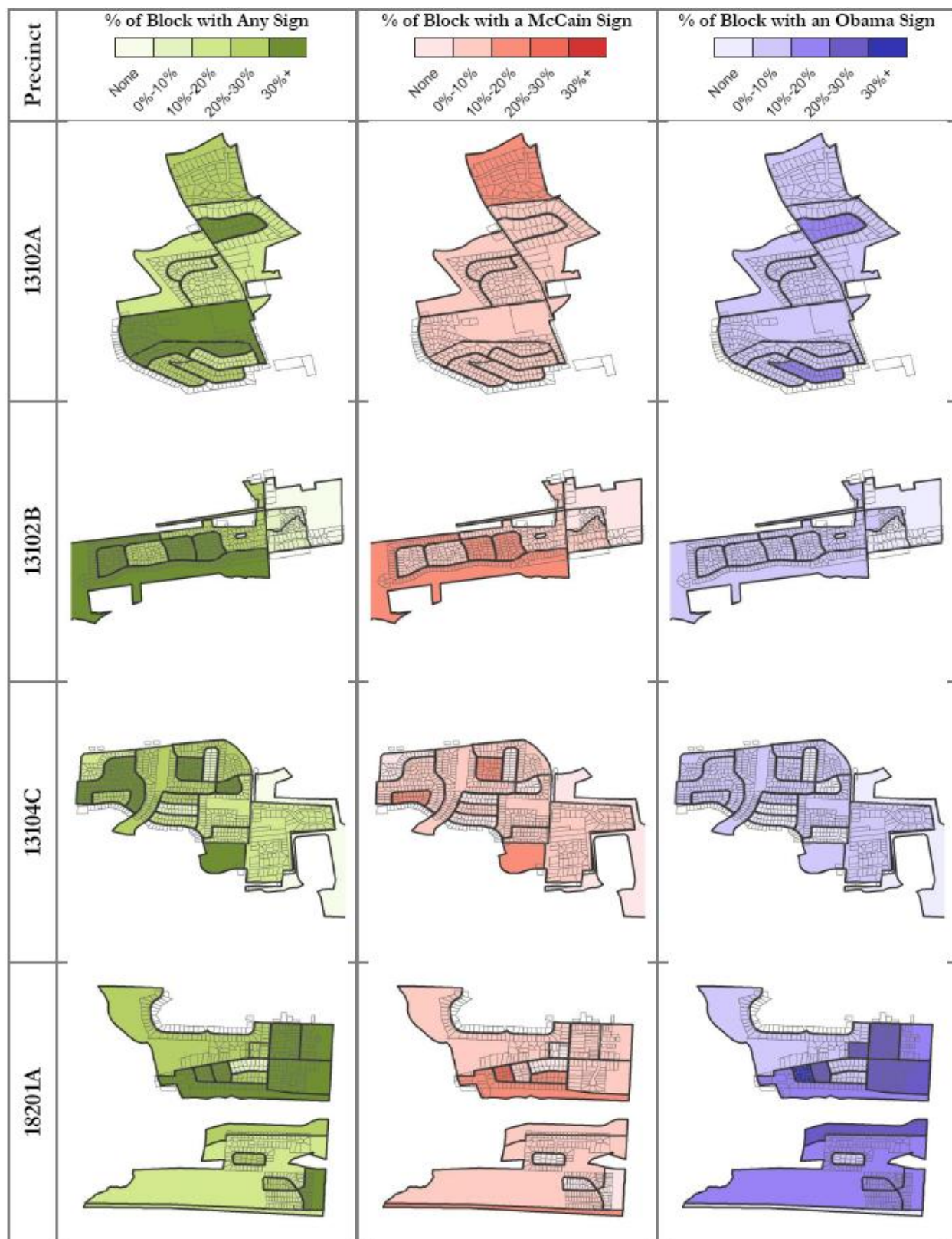
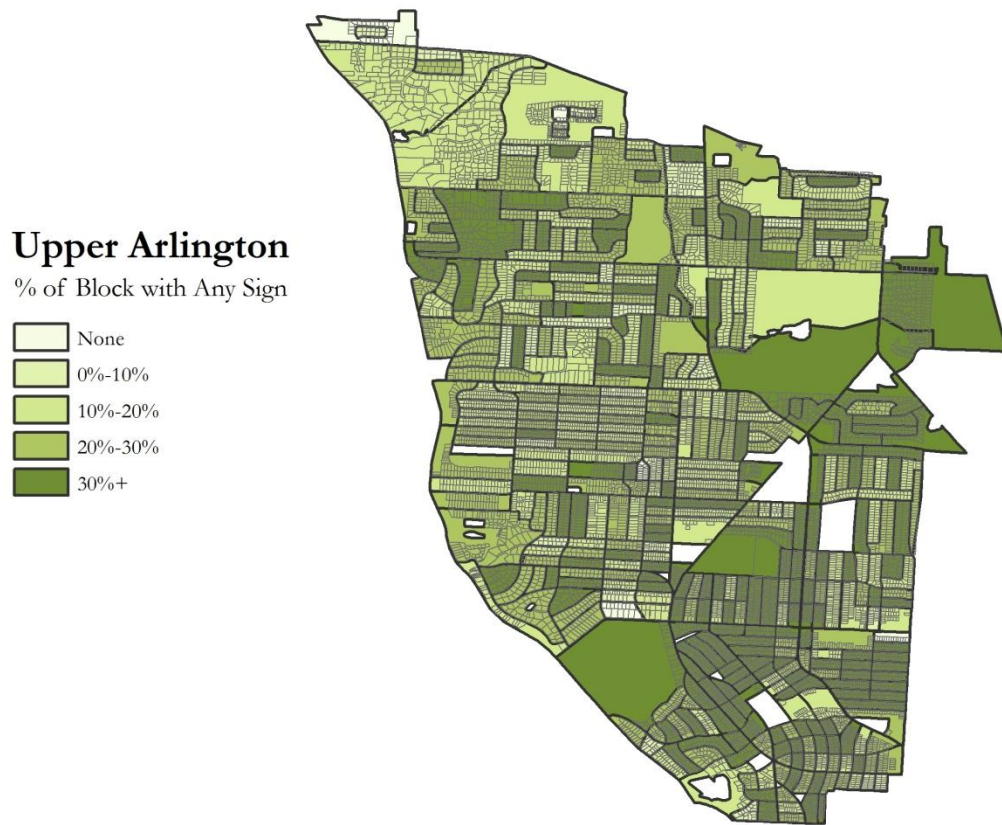
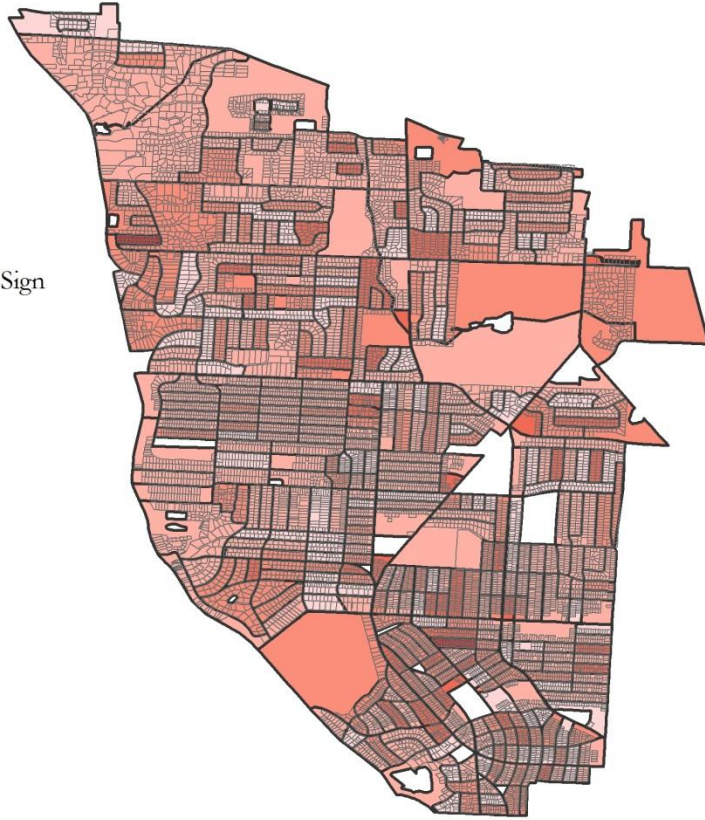


Figure 3: Upper Arlington Maps



Upper Arlington

% of Block with a McCain Sign



Upper Arlington

% of Block with an Obama Sign

