## POLITICAL SCIENCE

# The effect of partisanship and political advertising on close family ties

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Research on growing American political polarization and antipathy primarily studies public institutions and political processes, ignoring private effects, including strained family ties. Using anonymized smartphone-location data and precinct-level voting, we show that Thanksgiving dinners attended by residents from opposing-party precincts were 30 to 50 minutes shorter than same-party dinners. This decline from a mean of 257 minutes survives extensive spatial and demographic controls. Reductions in the duration of Thanksgiving dinner in 2016 tripled for travelers from media markets with heavy political advertising—an effect not observed in 2015—implying a relationship to election-related behavior. Effects appear asymmetric: Although fewer Democratic-precinct residents traveled in 2016 than in 2015, Republican-precinct residents shortened their Thanksgiving dinners by more minutes in response to political differences. Nationwide, 34 million hours of cross-partisan Thanksgiving dinner discourse were lost in 2016 owing to partisan effects.

American political partisanship has risen sharply over the past 25 years. More than 55% of Democrats and Republicans described "very unfavorable" feelings toward the opposing party in 2016, up from 17 to 21% in the mid-1990s; growing numbers of Independents express disfavor with both parties, and rising party defections increase polarization (1). Spatial partisan sorting produces increasingly homogeneous electoral "bubbles" at both state and local levels (2), and political minorities within these bubbles show reticence to participate in or reveal their party affiliation (3).

Animosity toward political rivals is not limited to the ballot box; implicit partisan biases manifest in discriminatory decisions even more frequently than racial or gender biases (4). Parents express intolerance of their children dating and marrying across partisan lines (5), and observed dating and marital choices segregate more strongly on politics than on physical attributes or personality characteristics (6). Political polarization affects decisions, such as where to work and shop, at higher rates than race, ethnicity, or religion (7).

We study whether politics strain close family ties by measuring family-gathering durations. After the historically divisive 2016 presidential election, 39% of American families avoided political conversations during the holidays, an aversion that spanned both party and socioeconomic lines (8). We examine Thanksgiving, which, in U.S. election years, may bring together family members with differing political views just weeks

after votes are cast. Anecdotal evidence suggests that, in the wake of the 2016 election, many families canceled or otherwise cut short Thanksgiving plans with their most politically problematic relatives (9).

Several cognitive biases in social and political psychology explain why individuals might limit such interactions. A "partisan selective exposure" motivation occurs when individuals avoid counterattitudinal political information that might engender cognitive dissonance or harm relationships (10). Numerous studies find "belief polarization," whereby individuals gravitate toward more extreme versions of their own initial positions during discussion of political issues (11). Exacerbating this effect, individuals also incorrectly expect others to respond to discussion and debate in the same direction as their own response, anticipating belief convergence rather than polarization (12), and attribute a lack of convergence to the bias and irrationality of others, while viewing themselves and copartisans as less ideological than cross-partisans (13). Our study examines whether these effects, which are well-studied in experimental settings among strangers, extend to close family gatherings.

We analyze how political differences affect the duration of Thanksgiving dinner by merging two datasets. Anonymized smartphone-location data from more than 10 million Americans allow observation of actual travel at extremely precise spatial and temporal levels. We combine this with a precinct-level database for the 2016 election to impute presidential voting at the finest spatial resolution possible. By comparing vote shares in an individual's home and Thanksgiving destination precincts, we test the relationship between political disagreement and time expenditure.

To isolate the particular effect of election-year political partisanship from a multitude of demo-

graphic and spatial confounds, we construct comparison sets of smartphone users that share the same home-destination pairs. Our measured effects are neither eliminated nor attenuated by comparing only matched users, suggesting that the measured time loss is not an artifact of politically correlated demographics or spatial sorting. Furthermore, because political advertising polarizes opinions (14) and heightens dislike for opposing parties (15), we compare partisan rifts between comparable users who fall just on opposite sides of media-market boundaries. Accounting for political advertising more than tripled our measured "Thanksgiving effect" in 2016, but not in 2015, before ads were run. This noneffect of yet-to-be-run ads acts as a political placebo test, further bolstering the argument that our measured Thanksgiving losses stem from political partisanship rather than from preexisting demographic or spatial confounds.

We collect precinct-level results for the 2016 presidential election through internet scraping and by contacting secretaries of state, boards of election, and individual county clerks via email, phone, or fax or in person. Finally, we match vote totals to precinct polygonal shapefiles using Geographic Information Systems (GIS) software. The resulting dataset covers 172,098 precincts across 99.9% of counties nationally (Fig. 1A).

Political advertising data are from Kantar Media's Campaign Media Analysis Group (16) and count every U.S. presidential television ad aired in all 210 Nielsen Designated Market Areas after 12 June 2016, including ads purchased directly by campaigns or outside groups such as political action committees. Data from the 2010 Decennial Census and the Census Bureau's 2012–2015 American Community Survey form the basis of demographic controls.

Location data rely on numerous smartphone apps and were aggregated by SafeGraph, a company that builds and maintains anonymized geospatial datasets for more than 10 million U.S. smartphones. These data consist of "pings," each identifying the coordinates of a particular smartphone at a moment in time. Our primary analysis includes 21 billion pings from November 2016 and 4.5 billion from November 2015.

To merge datasets, we infer the precinct and census block of each smartphone user's "home" on the basis of that user's pings between 1:00 a.m. and 4:00 a.m. over the 3 weeks before Thanksgiving. This procedure identifies more than 6 million approximate home locations in November 2016 (Fig. 1B), which we then link with precinct-level two-party vote shares and census demographics. Similarly, a user's Thanksgiving location is based on their modal location between 1:00 p.m. and 5:00 p.m. (24 November 2016 and 26 November 2015).

By construction, this sample is representative of the 77% of Americans who own smartphones, raising the question of whether our sample is politically representative of the American electorate as a whole. We test this by assigning to each resident a vote ratio proportional to the

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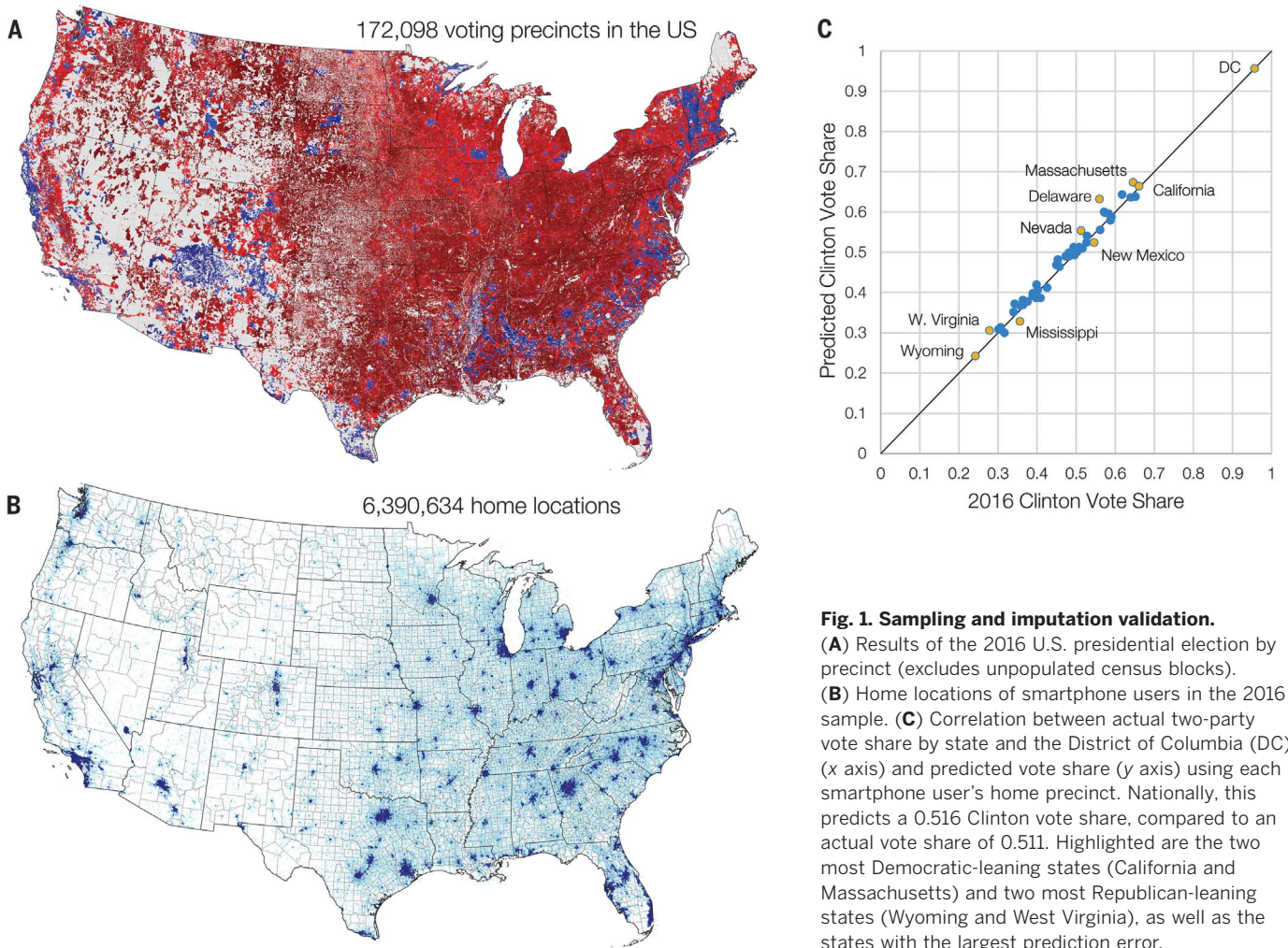†Corresponding author. Email: keith.chen@anderson.ucla.edu

**Fig. 1. Sampling and imputation validation.**
(**A**) Results of the 2016 U.S. presidential election by precinct (excludes unpopulated census blocks). (**B**) Home locations of smartphone users in the 2016 sample. (**C**) Correlation between actual two-party vote share by state and the District of Columbia (DC) (*x* axis) and predicted vote share (*y* axis) using each smartphone user's home precinct. Nationally, this predicts a 0.516 Clinton vote share, compared to an actual vote share of 0.511. Highlighted are the two most Democratic-leaning states (California and Massachusetts) and two most Republican-leaning states (Wyoming and West Virginia), as well as the states with the largest prediction error.

**Table 1. Effect of political mismatch on Thanksgiving dinner duration.** Each regression (column) estimates the effect of voting disagreement on 2016 Thanksgiving dinner duration. All results use linear regressions with fixed effects controlling for an individual's home location–cross–Thanksgiving destination. Stepwise regressions control for progressively finer pairs, culminating in a five-digit geohash, a square grid about 3 miles by 3 miles in size. The mean duration of Thanksgiving dinner was 257 min (SD = 162 min). The average probability of voting mismatch was 0.44 (SD = 0.10). Standard errors are reported in parentheses and clustered at the precinct-cross-precinct level. $R^2$, coefficient of determination. ***$P < 0.001$; **$P < 0.01$.

| Independent variable | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| | *Dependent variable: Duration of Thanksgiving dinner (min)* | | | |
| Probability of political mismatch | −21.58*** | −38.04*** | −45.23** | −56.26** |
| | (2.226) | (2.952) | (8.696) | (14.55) |
| Observations | 642,962 | 642,962 | 642,962 | 642,962 |
| $R^2$ | 0.0003 | 0.0660 | 0.458 | 0.661 |
| Fixed effects | None | County pairs | ZIP code pairs | Geohash-5 pairs |
| Number of fixed-effects groups | 0 | 35,507 | 302,716 | 414,950 |

2016 two-party vote share of their home precinct. A resident of a precinct that recorded 150 Clinton and 50 Trump votes, for example, would be assigned 0.75 Clinton and 0.25 Trump votes. Figure 1C compares these votes against actual 2016 two-party vote shares for each state and Washington, D.C. The 45° line represents where

states would lie if the SafeGraph sample politically matched the distribution of American voters. Our imputed votes are accurate to within 1 percentage point in 33 states and within 5 percentage points in all states. Nationally, the data suggest a two-party Democratic vote share of 0.516, compared to the actual share of 0.511.

We first examine whether, conditional on traveling for Thanksgiving dinner, the partisan distance between a home and destination affects that dinner's duration. We restrict our sample to residents who were home both in the morning and during the night of Thanksgiving, but who traveled for Thanksgiving dinner, to focus

**Table 2. Asymmetric effects of political mismatch.** Each regression (column) estimates the effect of voting disagreement between travelers and hosts [DPR traveler to RPR host (DPR→RPR) and RPR traveler to DPR host (RPR→DPR)] on 2016 Thanksgiving dinner duration. The $F$-test $P$ value tests for equality between coefficients, to test for an asymmetric mismatch effect. The average probability of DPRs attending a RPR-hosted dinner and vice versa was 0.221 and 0.215, respectively (for both, SD = 0.10). Standard errors are reported in parentheses and clustered at the precinct-cross-precinct level. ***$P$ < 0.001; **$P$ < 0.01; *$P$ < 0.05.

| Independent variable | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| | *Dependent variable: Duration of Thanksgiving dinner (min)* | | | |
| Probability DPR→RPR | −5.60* | −23.44*** | −30.16** | −44.53** |
| | (2.454) | (3.207) | (9.358) | (15.73) |
| Probability RPR→DPR | −38.74*** | −53.47*** | −60.23*** | −69.20*** |
| | (2.555) | (3.314) | (9.455) | (16.14) |
| $F$-test (RPR→DPR ≠ DPR→RPR) | 0.0001 | 0.0001 | 0.0001 | 0.0572 |
| Observations | 642,962 | 642,962 | 642,962 | 642,962 |
| $R^2$ | 0.0003 | 0.0662 | 0.458 | 0.661 |
| Fixed effects | None | County pairs | ZIP code pairs | Geohash-5 pairs |
| Number of fixed-effects groups | 0 | 35,507 | 302,716 | 414,950 |

**Table 3. Political advertising heightens partisan effects.** Each regression (column) estimates the effect of voting disagreement between travelers and hosts on 2016 Thanksgiving dinner duration. The second and fourth regressions explore whether political advertising heightens these effects. Media markets in swing states like Florida saw more than 26,000 ads in 2016. Standard errors are reported in parentheses and clustered at the precinct-cross-precinct level. A blank cell indicates that the variable was not included in this regression. ***$P$ < 0.001; *$P$ < 0.05.

| Independent variable | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| | *Dependent variable: Duration of Thanksgiving dinner (min)* | | | |
| Probability of political mismatch | −21.58*** | −14.40*** | | |
| | (2.226) | (2.588) | | |
| Probability DPR→RPR | | | −5.604* | 4.117 |
| | | | (2.454) | (2.879) |
| Probability RPR→DPR | | | −38.74*** | −33.68*** |
| | | | (2.555) | (2.978) |
| Number of political ads (1000 ads per market) | | 1.334*** | | 1.349*** |
| | | (0.185) | | (0.185) |
| Probability of political mismatch times number of political ads | | −2.645*** | | |
| | | (0.393) | | |
| Probability DPR→RPR times number of political ads | | | | −3.237*** |
| | | | | (0.417) |
| Probability RPR→DPR times number of political ads | | | | −2.122*** |
| | | | | (0.439) |
| Observations | 642,962 | 642,962 | 642,962 | 642,962 |
| $R^2$ | 0.0003 | 0.0004 | 0.0003 | 0.0004 |

our analysis on travelers who could control the duration of their visits. In Table 1, we estimate the following equation:

$$duration_{ij} = \alpha + \beta\ mismatch_{ij} + \gamma F_{ij} + \varepsilon_{ij}$$

where

$$mismatch_{ij} = P_i(1 - P_j) + (1 - P_i)P_j$$

In this specification, $duration_{ij}$ is the number of minutes traveler $i$ spent with host $j$ on Thanks-giving, $F_{ij}$ is a set of fixed effects that form groups of people defined by pairs of home ($i$) and destination ($j$) locations, and $\beta$ is the coefficient of interest. $P_i$ and $P_j$ are the two-party vote shares associated with home precincts for $i$ and $j$, where $P_i = democratic_i/(democratic_i + republican_i)$. By using $P_i$ and $P_j$, $mismatch_{ij}$ is the imputed probability that persons $i$ and $j$ voted for different candidates in 2016. In all tables, regressions control for progressively finer ($i$, $j$) location pairs, culminating in five-digit geohash (geohash-5) boxes, a global grid of rec-

tangular areas, each about 3 miles by 3 miles in size.

To control for confounds including demographics, distance, and travel time, our regressions compare Thanksgiving dinner durations between travelers with the same home and destination areas. For example, regression 3 compares two travelers if and only if they both live in ZIP code $X$ and visit ZIP code $Y$. The coefficient of interest $\beta$ measures the reduction in Thanksgiving dinner duration between travelers within the same $F_{ij}$ comparison groups but who likely voted differently than their Thanksgiving hosts. Standard errors are clustered at the home precinct–cross–destination precinct level. We use progressively tighter spatial controls to control for both demographics and travel distance simultaneously.

The results in Table 1 indicate that families that were likely to have voted for different presidential candidates spent about 30 to 50 fewer minutes together—subtracted from an average Thanksgiving dinner time of 4.2 hours—after controlling for both travel distance and location-correlated demographics. As we add finer spatial controls, our estimate of $\beta$ remains fairly stable, with a point estimate of 56.3 ± 14.6 min under our tightest geohash-5 controls. In table S4, we report qualitatively identical results when demographics such as race, age, education, income, and employment are controlled for separately.

We examine the two components of $mismatch_{ij}$, $P_i(1 - P_j)$ and $(1 - P_i)P_j$, to separately measure the effect of voting disagreement among Democratic-precinct residents (DPRs) visiting Republican-precinct residents (RPRs) and vice versa. Table 2 demonstrates that, conditional on traveling, DPRs shortened their visits to RPR hosts by about 20 to 40 min, whereas RPRs shortened their visits to DPRs by about 50 to 70 min. $F$-test results indicate that these estimates are statistically different ($P$ < 0.0001 in four of five specifications), with RPRs shortening their cross-party stays by more minutes than DPRs.

When investigating whether these effects interact with local political advertising, we find that cross-partisan Thanksgiving dinners are further shortened by around 2.6 min on average for every 1000 political advertisements aired in the traveler's home media market (Table 3). Some media markets in swing states saw more than 26,000 ads over the course of the campaign, implying a 69-min-shorter Thanksgiving dinner for vote-mismatched families in Orlando, for example, compared to those in markets without advertising. Although this effect may not be solely due to advertising, which may be correlated with other campaign activities such as rallies, campaign visits, and fundraising efforts, these results bolster the conclusion that measured effects on Thanksgiving dinner duration likely stem from an increased intensity and salience of partisan differences.

The results in table S1 support this finding and report the results of a placebo test concerning whether advertisements in 2016 affected Thanksgiving dinner behavior the year before

airing. Regardless of whether we pool smartphone users or split the sample into DPRs and RPRs, we find no evidence of preexisting partisan effects in regions that witnessed high advertising levels. Although our empirical results estimate briefer Thanksgiving dinners among cross-partisan gatherings in both years, the ad-related amplification of this effect is present only in 2016, both in statistical significance and magnitude, supporting our conjecture that the main effect is most likely political in nature.

An examination of destination choices suggests that travelers did not change plans to reduce political divisions from 2015 to 2016. Among travelers who traveled in both years—the strongest possible control for demographic and spatial confounds—we observe no appreciable difference in the distribution of likely political mismatch (fig. S1). This finding suggests that travelers were more likely to change the duration of Thanksgiving gatherings than to change the destination.

Finally, tables S2 and S3 estimate linear probability models for the choice of whether to travel for Thanksgiving, in both 2015 and 2016. When matched residents living within 1.5 miles of each other are compared, DPRs reduced their likelihood of travel between 2015 and 2016 by 2 percentage points more than comparable RPRs, an effect that increases substantially in areas with heavy political advertising.

Examining only those residents included in both the 2015 and 2016 data yields qualitatively similar results. Among residents at home on Thanksgiving morning in both years, 56.4% traveled for Thanksgiving in 2015, whereas 51.9% traveled in 2016 ($n$ = 28,890; Fisher's exact text, $P < 0.0005$). Accompanying this difference is a reduction in Thanksgiving dinner duration for those cross-partisan dinners that still occurred. By comparing travelers who went to the same location both years ($n$ = 1271), we estimate that politically mismatched gatherings declined by 42.1 ± 41.4 min. Although this small sample size precludes statistical significance, this estimate is very close to our findings shown in Table 1.

By aggregating across the 77% of American adults who own smartphones (17), our results suggest that partisan differences cost Americans 73.6 million hours of Thanksgiving time with others in 2016, 47.8% from DPRs and 52.2% from RPRs. Political advertising–related partisanship comprised 15.9 million of lost person-hours, 46.3% from DPRs and 53.7% from RPRs. Altogether, an estimated 33.9 million person-hours of cross-partisan discourse were eliminated, perhaps creating a feedback mechanism by which partisan segregation reduces opportunities for close cross-party conversations.

Our findings have several implications, both for the literature and for campaign policy. After the 2016 election, anecdotal media reports and online social-media behavior (18) demonstrated an avoidance of personal confrontations over political issues among Democratic voters, findings our study corroborates. RPRs, however, were more sensitive to partisan differences at Thanksgiving dinners, an effect that supports findings of greater partisan-selective exposure among Republicans in news-media consumption (19). Our results suggest that partisan polarization extends in quantitatively meaningful ways to close family settings and that political advertising and related campaign efforts can exacerbate these fissures. As abbreviated Thanksgiving gatherings tend to accumulate in regions with greater campaign activity, policies designed to shorten campaigns may reduce the private costs of political polarization.

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# Science

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### Curtailed conversations

Most articles written about U.S. politics in the past few years have mentioned the increasing polarization of the electorate. But is this real, or does it merely reflect the increasing polarization of the media? Chen and Rohla estimate that in 2016, Thanksgiving dinners in which the hosts and guests lived in oppositely voting precincts were up to 50 minutes shorter than same-party-precinct dinners. That is, family members, adjured to avoid talking about contentious subjects, may have simply talked less.
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