



# The cost of racial animus on a black candidate: Evidence using Google search data<sup>☆</sup>



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## ABSTRACT

How can we know how much racial animus costs a black presidential candidate, if many people lie to surveys? I suggest a new proxy for an area's racial animus from a non-survey source: the percent of Google search queries that include racially charged language. I compare the proxy to Barack Obama's vote shares, controlling for the vote share of the previous Democratic presidential candidate, John Kerry. An area's racially charged search rate is a robust negative predictor of Obama's vote share. Continuing racial animus in the United States appears to have cost Obama roughly four percentage points of the national popular vote in both 2008 and 2012. The estimates using Google search data are 1.5 to 3 times larger than survey-based estimates.

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## 1. Introduction

*Note: This research uses Google search terms containing sensitive language. I refer to these words in coded language in the text. Readers can find the exact words in Table B.1.*

Does racial animus cost a black candidate a substantial number of votes in contemporary America? The most recent review of the literature is inconclusive: “Despite considerable effort by numerous researchers over several decades, there is still no widely accepted answer as to whether or not prejudice against blacks remains a potent factor within American politics” (Huddy and Feldman, 2009).

There are two main reasons the answer to this question is of interest to scholars: first, it would help us better understand the extent of contemporary prejudice<sup>1</sup>; second, it would increase our understanding of the determinants of voting.<sup>2</sup> There is one main reason the question

has proven so difficult: individuals' tendency to withhold socially unacceptable attitudes, such as negative feelings towards blacks, from surveys (Tourangeau and Ting, 2007; Berinsky, 1999, 2002; Gilens et al., 1998; Kuklinski et al., 1997).

This paper uses non-survey-based methodology. I suggest a data source not previously used to study prejudice. I proxy an area's racial animus based on the percent of Google search queries that include racially charged language. I compare the proxy to Barack Obama's vote shares, controlling for John Kerry's presidential vote share.

Google data, evidence suggests, are unlikely to suffer from major social censoring: Google searchers are online and likely alone, both of which make it easier to express socially taboo thoughts (Kreuter et al., 2009). Individuals, indeed, note that they are unusually forthcoming with Google (Conti and Sobiesk, 2007). The large number of searches for pornography and sensitive health information adds additional evidence that Google searchers express interests not easily elicited by other means. Furthermore, aggregating information from millions of searches, Google can meaningfully reveal social patterns. The percent of Google searches that include the word “God,” for example, explains more than 60% of area-level variation in belief in God.

I define an area's racially charged search rate as the percent of Google searches, from 2004 to 2007, that included the word “[Word 1]” or “[Word 1](s).” I choose the most salient word to constrain data-mining.<sup>3</sup> I do not include data after 2007 to avoid capturing reverse

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<sup>1</sup> Kofi Charles and Guryan (2011) survey some of the voluminous literature studying modern discrimination. Creative field environments used to study discrimination include NBA referees (Price and Wolfers, 2010); baseball umpires (Parsons et al., 2011); baseball card sales (List, 2004); motor vehicle searches (Knowles et al., 2001); and employers receiving manipulated resumes (Bertrand and Mullainathan, 2004).

<sup>2</sup> Rational choice theory says that economic impacts of outcomes fully determine voting. A number of scholars have previously found important deviations from an extreme interpretation of this model (Benjamin and Shapiro, 2009; Alesina and Rosenthal, 1995; Berggren et al., 2010; Wolfers, 2002).

<sup>3</sup> Kennedy (2003, p. 22) says that this is “the best known of the American language's many racial insults ... the paradigmatic slur.”

causation, with dislike for Obama causing individuals to use racially charged language on Google.

The epithet is searched for with some frequency on Google. From 2004 to 2007, the word “[Word 1](s)” was included in roughly the same number of Google searches as words and phrases such as “migraine(s),” “economist,” “sweater,” “Daily Show,” and “Lakers.” The most common searches that include the epithet, such as “[Word 1] jokes” and “I hate [Word 1](s),” return websites with derogatory material about African-Americans. From 2004 to 2007, the searches were most popular in West Virginia; upstate New York; rural Illinois; eastern Ohio; southern Mississippi; western Pennsylvania; and southern Oklahoma.

Racially charged search rate is a significant, negative predictor of Obama's 2008 and 2012 vote shares, controlling for Kerry's 2004 vote share. The result is robust to controls for changes in unemployment rates; home-state candidate preference; Census division fixed effects; demographic controls; and long-term trends in Democratic voting. The estimated effect is somewhat larger when adding controls for an area's Google search rates for other terms that are moderately correlated with search rate for “[Word 1]” but is not evidence for racial animus. In particular, I control for search rates for “African American,” “[Word 2],” (the alternate spelling used in nearly all rap songs that include the word), and profane language.

A non-racial explanation for the results might be that areas with higher racially charged search rates became less likely, during this time period, to support Democratic candidates, more generally. This, though, does not fit the evidence. There is not a significant relationship between an area's racially charged search rate and changes in either House Democratic vote shares or measured liberalism over the same time period. Further, polling data suggest that neither Hillary Clinton nor John Edwards would have faced a similar punishment in areas with high racially charged search rates had either been the 2008 nominee instead of Obama.

The preferred point estimates imply that, relative to the most racially tolerant areas in the United States, prejudice cost Obama 4.2 percentage points of the national popular vote in 2008 and 4.0 percentage points in 2012. These numbers imply that, among white voters who would have supported a white Democratic presidential candidate in 2008 (2012), 9.1 (9.5) percent did not support a black Democratic presidential candidate.

Obama lost substantially more votes from racial animus, I argue, than he gained from his race. Back-of-the-envelope calculations suggest that Obama gained at most only about one percentage point of the popular vote from increased African-American support. The effect was limited by African-Americans constituting less than 13% of the population and overwhelmingly supporting every Democratic candidate. Evidence from other research, as well as some new analysis in this paper, suggest that few white voters swung in Obama's favor in the 2008 or 2012 general elections due to his race.<sup>4</sup>

This paper builds on and contributes to the large literature, reviewed by Huddy and Feldman (2009), testing for the effects of racial attitudes on black candidates. The Google-based methodology finds significantly larger effects of racial attitudes on Obama than comparable estimates using a survey-based methodology (Mas and Moretti, 2009; Piston, 2010; Pasek et al., 2010; Schaffner, 2011; Lewis-Beck et al., 2010; Kinder and Dale-Riddle, 2012; Tesler and Sears, 2010a). In Section 4.1, I argue that this paper's methodology also allows for a more robust test of a causal effect of racial animus, relative to other papers in the literature.

In addition, the new proxy of area-level prejudice might be useful to literatures in social economics (Alesina et al., 2001; Alesina and La Ferrara, 2002), labor economics (Charles and Guryan, 2008), and urban economics (Cutler et al., 1999; Card et al., 2008).

More generally, the paper adds further support for a potentially large role for Google data in the social sciences.<sup>5</sup> Previous papers using the data source have tended to note correlations between Google searches and other data (Ginsberg et al., 2009; Seifter et al., 2010; Varian and Choi, 2010; Scheitle, 2011). This paper shows clearly that Google search query data can do more than correlate with existing measures; on socially sensitive topics, they can give better data and open new research on old questions. If I am correct that the Google database contains the best evidence on such a well-examined question, that the Google database might contain the best evidence on many important questions does not seem such a large leap.<sup>6</sup>

## 2. Google-search proxy for an area's racial animus

### 2.1. Motivation

Before discussing the proxy for racial animus, I motivate using Google data to proxy a socially sensitive attitude. In 2007, nearly 70% of Americans had access to the internet at home (CPS, 2007). More than half of searches in 2007 were performed on Google (Burns, 2007). Google searchers are somewhat more likely to be affluent, though large numbers of all demographics use the service (Hopkins, 2008).

Aggregating millions of searches, Google search data consistently correlate strongly with demographics of those one might most expect to perform the searches (see Table 1). Search rate for the word “God” explains 65% of the variation in percent of a state's residents believing in God. Search rate for “gun” explains 62% of the variation in a state's gun ownership rate. These high signal-to-noise ratios hold despite some searchers typing the words for reasons unrelated to religion or firearms and not all religious individuals or gun owners actually including the term in a Google search (The ‘top search’ for “God” is “God of War,” a video game. The ‘top search’ for “gun” is “Smoking Gun,” a website that reveals sensational, crime-related documents.) If a certain group is more likely to use a term on Google, aggregating millions of searches and dividing by total searches will give a good proxy for that group's area-level population.

Furthermore, evidence strongly suggests that Google elicits socially sensitive attitudes. As mentioned in the Introduction, the conditions under which people search – online, likely alone, and not participating in an official survey – limit the concern of social censoring. The popularity of search terms related to sensitive topics further supports this use. The word “porn,” for example, is included in more searches in the United States than the word “weather.”<sup>7</sup>

<sup>5</sup> This paper is also related to an emerging literature that uses text as data. Important contributions in this literature include Lucca and Trebbi (2009), which codes Fed announcements to find how the market responds to them and Gentzkow and Shapiro (2010), which measures the slant of U.S. newspapers based on the words that they use.

<sup>6</sup> Indeed, since the first draft of this paper, Google search data has been used to predict turnout (Stephens-Davidowitz, 2013b); measure child abuse (Stephens-Davidowitz, 2012); quantify job search (Baker and Fradkin, 2013); and measure the size of the gay population (Stephens-Davidowitz, 2013a); quantify interest in birth control and abortion (Kearney and Levine, 2014); and detect gender biases and son preference of parents (Stephens-Davidowitz, 2014).

<sup>7</sup> Only about 20% of Americans admit to the GSS that they have watched a pornographic movie within the past year.

<sup>4</sup> The effect of race on the overall probability of being elected president would also have to consider the effects of race on primary voting and on fundraising. These questions are beyond the scope of this paper.

**Table 1**  
Signal-to-noise ratio in Google search terms.

Term	Underlying variable	t-Stat	R <sup>2</sup>
God	Percent believe in god	8.45	0.65
Gun	Percent own gun	8.94	0.62
African American(s)	Percent Black	13.15	0.78
Hispanic	Percent Hispanic	8.71	0.61
Jewish	Percent Jewish	17.08	0.86

Notes: The t-stat and R<sup>2</sup> are from a regression with the normalized search volume of the word(s) in the first column as the independent variable and measures of the value in the second column as the dependent variable. The normalized search volume for all terms is from 2004 to 2007. All data are at the state level. Percent Black and Percent Hispanic are from the American Community Survey, for 2008; the Jewish population is from 2002, gun ownership from 2001, and belief in God from 2007. Jewish data are missing one observation (South Dakota); belief in God data are missing for 10 states. The data for belief in God, percent Jewish, and percent owning guns can be found at <http://pewforum.org/how-religious-is-your-state-.aspx>, <http://www.jewishvirtuallibrary.org/jsource/US-Israel/usjewpop.html>, and <http://www.washingtonpost.com/wp-srv/health/interactives/guns/ownership.html>, respectively.

## 2.2. Proxy

I define an area *j*'s racially charged search rate as the percentage of its Google searches, from 2004 to 2007, that included the word "[Word 1]" or its plural.<sup>8</sup>

$$\text{Racially Charged Search Rate}_j = \left[ \frac{\text{Google searches including the word "[Word 1](s)"}}{\text{Total Google searches}} \right]_{j,2004-2007} \cdot (1)$$

The racial epithet is a fairly common word used in Google search queries: Fig. 1 shows other terms that were included in a similar number of searches, from 2004 to 2007.<sup>9</sup> The word "migraine" was included in about 30% fewer searches than the epithet. The word "Lakers" and the phrase "Daily Show" were each included in about 5% more searches.<sup>10</sup> While these words and phrases were chosen rather arbitrarily as benchmarks, the number of searches including the term can also be compared to the number of searches including one of the most common words, "weather." Search volume including the racial epithet, from 2004 to 2007, was within two orders of magnitude of search volume including "weather."<sup>11</sup>

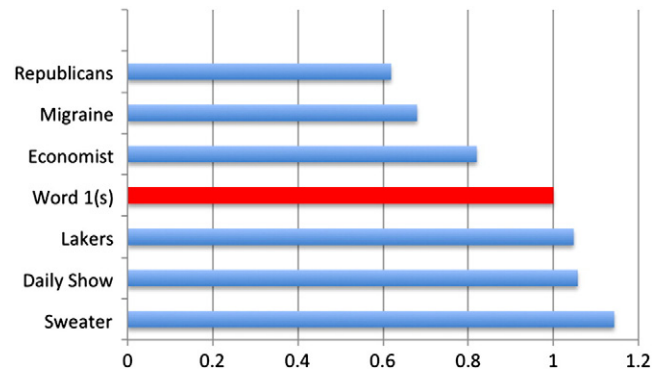
What are searchers looking for? About one quarter of the searches including the racial epithet, from 2004 to 2007, also included the

<sup>8</sup> As mentioned in the Introduction, data prior to 2008 are used to avoid capturing reverse causation. About 5% of searches including "[Word 1]" in 2008 also included the word "Obama," suggesting that feelings towards Obama were a factor in racially charged search in 2008. Searches including both the epithet and "Obama" were virtually non-existent in 2007. It is also worth noting that area-level search rates for the racial epithet are highly correlated through time, and any choice of dates will yield roughly similar results. For example, the correlation between 2004–2007 and 2008–present state-level racially charged search rate is 0.94. Using just one word or phrase, even one that can be used for different reasons, to proxy an underlying attitude builds on the work of scholars who have conducted text analysis of newspapers. For example, Saiz and Simonsohn (2008) argue that news stories about a city that include the word "corruption" can proxy a city's corruption, and Gentzkow et al. (2011) show that, historically, Republican (Democratic) newspapers include significantly more mentions of Republican (Democratic) presidential candidates.

<sup>9</sup> The percentage of Google searches including the racial epithet was roughly constant from 2004 to 2008. There were, though, notable spikes in the days following Hurricane Katrina and in early November 2008, particularly on Election Day. The percentage of Google searches including the term dropped after the 2008 election and has consistently been about 20% lower during Obama's presidency than prior to his presidency. An emerging literature is examining how Obama's presidency has affected racial attitudes (DellaVigna, 2010; Valentino and Brader, 2011; Tesler, 2012; Tesler and Sears, 2010b).

<sup>10</sup> Google data are case-insensitive. So I am comparing the racial epithet to searches that include either "lakers" or "Lakers."

<sup>11</sup> Absolute search volumes for words, during this time period, are not publicly available. Google AdWords informs us that roughly 7 million searches have included the racial epithet in the previous year. As mentioned earlier, the term was included in about 20% more Google searches during the time period used than the previous year. However, of course, far fewer searches were conducted on Google during this time period than in more recent years.



**Fig. 1.** Selected words and phrases included in Google searches roughly as frequently as "[word 1](s)," 2004–2007. Notes: This figure shows selected words and phrases included in a similar number of searches, from 2004 to 2007, as "[Word 1](s)." The number corresponds to the ratio of total Google searches that include that word to total Google searches that include the racial epithet. "Daily Show," for example, was included in about 6% more searches than the racial epithet. "Economist" was included in about 20% fewer searches. It is worth emphasizing again that this counts any searches including the word or phrase. So searches such as "The Daily Show" and "Daily Show clips" will be counted in the search total for "Daily Show." And Google considers searches case-insensitive. So "daily show" and "daily show clips" would also count. While the words included were rather arbitrarily selected, another benchmark to use is "weather." "Weather" was included in only about 81 times more searches than "[Word 1](s)" during this time period. All numbers presented were estimated using Google Trends.

word "jokes," searches that yield derogatory entertainment based on harsh African-American stereotypes. These same joke sites, with derogatory depictions of African-Americans, are also among the top returns for a Google search of just the epithet or its plural, representing about 10% of total searches that included the epithet.<sup>12</sup> More information on the searches can also be gleaned from the 'top searches,' the most common searches before or after searches including the word (see Table 2). Searchers are consistently looking for entertainment featuring derogatory depictions of African-Americans. The top hits for the top racially charged searches, in fact, are nearly all textbook examples of antilocution, a majority group's sharing stereotype-based jokes using coarse language outside a minority group's presence. This was determined as the first stage of prejudice in Allport's (1979) classic treatise.

Readers may be concerned that a substantial number of searchers are African-American, since the word is often used by African-Americans. This is unlikely: the common term used in African-American culture is "nigga(s)," which Google considers a separate search from the term ending in "er" (Rahman, 2011).<sup>13</sup> Table 3 shows the top searches for "nigga(s)." In contrast to the top searches for the term ending in "er," the top searches for "nigga(s)" are references to rap songs. Table 3 also shows that, even among the 5% of searches that include the epithet ending in "er" and also include the word "lyrics," the 'top searches' are for racially charged country music songs.

All data are from Google Trends. I obtain data for all 50 states and 196 of 210 media markets, encompassing more than 99% of American voters.<sup>14</sup> I use media-market-level regressions when other data sources

<sup>12</sup> I do not know the order of sites prior to my beginning this project, in June 2011. The ordering of sites for searches of just the epithet has changed slightly, from June 2011 to April 2012. For example, while joke sites were the second, third, and fourth returns for a search for "[Word 1](s)" in June 2011, these sites were passed by an Urban Dictionary discussion of the word by April 2012.

<sup>13</sup> Rap songs including the version ending in 'a' are roughly 45 times as common as rap songs including the version ending in 'er.' — author's calculations based on searches at <http://www.rapartists.com/lyrics/>.

<sup>14</sup> Google Trends says that the media market data corresponds to measures of Arbitron. I have confirmed that they actually correspond to designated media markets, as defined by Nielsen. I match other data to the media markets using Gentzkow and Shapiro (2008).

**Table 2**  
Top searches for “[Word 1](s)”.

Rank	'04–'07 search	'08–'11 search
	Data used	Data not used
1.	jokes	jokes
2.	[Word 1] jokes	[Word 1] jokes
3.	white [Word 1]	obama [Word 1]
4.	[Word 2]	[Word 2]
5.	hate [Word 1]	black [Word 1]
6.	i hate [Word 1](s)	funny [Word 1]
7.	black jokes	[Word 1] song
8.	the word [Word 1]	the word [Word 1]
9.	racist jokes	nas [Word 1]
10.	kkk	i hate [Word 1](s)

Notes: This table shows the ‘top searches’ for “[Word 1](s).” 2004–2007 is the time period for the search volume used in the regressions and figures to limit reverse causation. Results would be similar regardless of the time period selected, as the state-level correlation between the two periods is 0.94. Depending on the draw, the ‘top searches’ might be slightly different. Top searches, according to Google, ‘are related to the term,’ as determined ‘by examining searches that have been conducted by a large group of users preceding the search term you’ve entered, as well as after,’ as well as by automatic categorization.

are available at the media-market level and state data when such data are not available.<sup>15</sup>

Racially charged search rates, for the 50 states and the District of Columbia, are shown in Table A.1. Racially charged search rates for media markets are shown in Fig. 2. The search rate was highest in West Virginia; upstate New York; rural Illinois; eastern Ohio; southern Mississippi; western Pennsylvania; and southern Oklahoma. The search rate was lowest in Laredo, TX – a largely Hispanic media market; Hawaii; parts of California; Utah; and urban Colorado.

### 2.3. Predictors of racially charged search rate

#### 2.3.1. Demographics

Table 4 shows the demographic predictors of racially charged search rate at the media market level. The demographic factor correlating strongest with racially charged search rate is the percentage of the population with a bachelor’s degree. A 10 percentage point increase in college graduates is correlated with almost a one standard deviation decrease in racially charged search rate. Younger and more Hispanic areas are less likely to search the term.

A major question among scholars of prejudice is the effects of living near members of a group on prejudice towards that group: Does living near African-Americans make white Americans more or less likely to harbor racial animus? The Google data offer evidence for racial threat, the theory that the presence of an out-group can threaten an in-group and create racial animosity (Key, 1949; Glaser, 1994; Glaser and Gilens, 1997). Racial threat predicts a quadratic relationship between the percentage of the population that is black and racial animus (Blalock, 1967; Taylor, 1998; Huffman and Cohen, 2004; Enos, 2010). Zero African-Americans means race is not salient and racial animus may not form. Near 100% African-American communities have few white people; white individuals with racial animus are unlikely to choose such a community. Columns (3) and (4) of Table 4 offer support for this theory. Indeed, the preferred fit between racially charged search rate and percent black is quadratic. The numbers imply that racial animus is highest when African-Americans make up between 20 and 30% of the population. Three of the ten media markets with the highest racially charged search rate – Hattiesburg–Laurel, Biloxi–Gulfport, and Florence–Myrtle Beach – are between 20 and 30% black.

<sup>15</sup> It should be noted that some of this data are not easily obtained. If the total number of searches, for a given area and time period, is below an unreported, but clearly high, threshold, Google does not report the data. In Appendix C, I show what I think is the first algorithm for obtaining data that does not cross the threshold.

**Table 3**  
Music and terms, 2004–2007.

Rank	Top searches for ‘[Word 1] lyrics’	Top searches for ‘[Word 2](s)’
1.	[Word 1] song	[Word 2] lyrics
2.	[Word 1] song lyrics	my [Word 2]
3.	[Word 1] jokes	[Word 2] lyrics
4.	white [Word 1]	hood [Word 2]
5.	[Word 1] hatin me	my [Word 2]
6.	white [Word 1] lyrics	lyrics hood [Word 2]
7.	johnny rebel lyrics	[Word 2] stole
8.	johnny rebel	[Word 2] stole my
9.	david allen coe	my [Word 2] lyrics
10.	lyrics alabama [Word 1]	[Word 2] what

Notes: The second column shows the ‘top searches’ reported for searches including both “[Word 1]” and “lyrics.” The third column shows the ‘top searches’ reported for searches including either “[Word 2]” or “[Word 2](s).” The method for calculating ‘top searches’ is discussed in Table 2. Also noted there, depending on the particular draw, the ranks and terms might differ somewhat.

#### 2.3.2. Comparisons with GSS

Fig. 3 compares the Google proxy to the General Social Survey (GSS) measure of Mas and Moretti (2009): percent supporting a law banning interracial marriage. Since the GSS only includes data for 44 states plus the District of Columbia, the figures and regressions only include 45 observations. The Google measure has a correlation of 0.6 with the measure of Mas and Moretti (2009).<sup>16</sup>

Some of the outliers are likely due to small samples for some states using GSS data. For example, Wyoming ranks as significantly more racially prejudiced using the Mas and Moretti (2009) proxy than the Google proxy. However, only 8 white individuals living in Wyoming were asked this question by the GSS. (Two, or twenty-five percent, said that they supported a law banning interracial marriage.)

The GSS and Google proxies for racial prejudice noticeably differ in their relationship with ideology. The GSS supports some popular wisdom that prejudice against African-Americans is now a larger factor among Republicans than Democrats: The higher Kerry’s 2004 vote share in a state, the lower the percentage of whites admitting opposition to interracial marriage. In contrast, there is no statistically significant correlation between the Kerry 2004 vote share and racially charged search rate, at either the state or media market level.<sup>17</sup> One potential reason for this discrepancy is that racial prejudice is more socially unacceptable among Democrats. Thus, underreporting of prejudice in surveys will be more severe in areas with more Democrats. And surveys, such as the GSS, will falsely find a negative correlation between percent Democrat and prejudice against African-Americans.

### 3. The effects of racial animus on a black presidential candidate

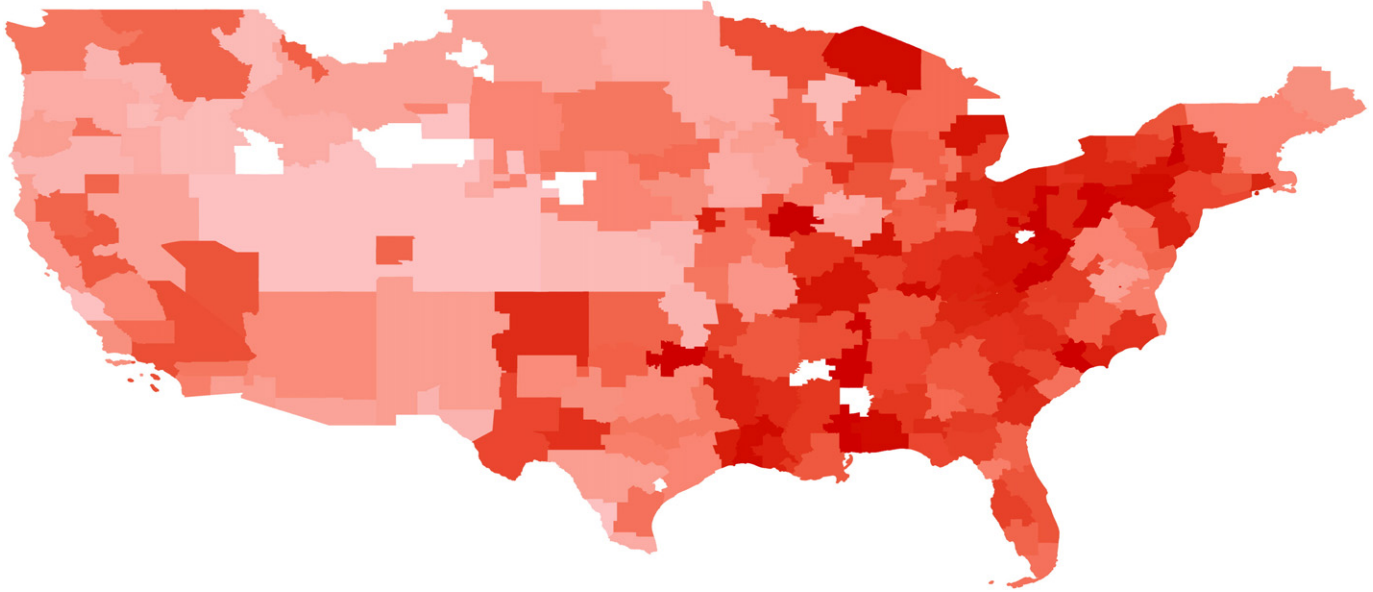
Section 3 argues that the frequency with which an area’s Google searches include the word “[Word 1](s)” – a word, overall, used about as frequently in searches as terms such as “Daily Show” and “Lakers,” with most of them returning derogatory material about African-Americans – give a strong proxy for an area’s racial animus. This section uses the proxy to test the effects of racial animus on an election with a black candidate. The section focuses on the significance and robustness of the results. I hold off until Section 4 in fully interpreting the magnitude of the effects.

#### 3.1. The effects of racial animus on black vote share

To test the effects of racial animus on a black candidate’s vote share, I compare the proxy to the difference between an area’s support for Barack Obama in 2008 and John Kerry in 2004. I show later that the

<sup>16</sup> The Google measure has a correlation of 0.66 with the measure of Charles and Guryan (2008), average prejudice from 1972 to 2004. I thank the authors for providing their data.

<sup>17</sup> The lack of a relationship holds controlling for percent black, as well.



**Fig. 2.** Racially charged search rate, media market. *Notes:* This maps search volume for “[Word 1](s),” from 2004 to 2007, at the media market level. Darker areas signify higher search volume. White areas signify media markets without data. Alaska and Hawaii, for which data are available, are not shown.

estimated effects on Obama in 2012 were almost identical to the estimated effects on Obama in 2008.

Define %Obama2008<sub>*j*</sub> as the percent of total two-party votes received by Obama in 2008 and %Kerry2004<sub>*j*</sub> as the percent of total two-party votes received by Kerry in 2004. In other words, %Obama2008<sub>*j*</sub> is an area's total votes for Obama divided by its total votes for Obama or John McCain. %Kerry2004<sub>*j*</sub> is an area's total votes for Kerry divided by its total votes for Kerry or George W. Bush. Then (%Obama2008 – %Kerry2004)<sub>*j*</sub> is meant to capture an area's relative preference for a black compared to a white candidate.

The idea is that the different races of the Democratic candidates were a major difference between the 2004 and 2008 presidential races. The 2004 and 2008 presidential elections were similar in terms of perceived candidate ideology. In 2004, about 44% of Americans viewed John Kerry as liberal or extremely liberal. In 2008, about 43%

viewed Barack Obama as liberal or extremely liberal.<sup>18</sup> Neither Kerry nor Obama came from a Southern state, important as Southern states have been shown to prefer Southern Democratic candidates (Campbell, 1992). One major difference between the 2004 and 2008 elections was the popularity of the incumbent Republican president. In 2004, George W. Bush ran as a fairly popular incumbent. In 2008, no incumbent was on the ballot, and the Republican president had a historically low approval rating. We would expect a countrywide positive shock to Obama relative to Kerry.<sup>19</sup>

Before adding a full set of controls, I plot the correlation between Racially Charged Search Rate<sub>*j*</sub> and (%Obama2008 – %Kerry2004)<sub>*j*</sub>. Fig. 4, Panel (a), shows the relationship at the media market level.<sup>20</sup> Likely due to the different election conditions in 2004 and 2008, Obama does indeed perform better than Kerry country-wide. (See Table 5 for a set of summary statistics, including Obama and Kerry support.) However, Obama loses votes in media markets with higher racially charged search rates. The relationship is highly statistically significant ( $t = -7.36$ ), with the Google proxy explaining a substantial percentage of the variation in change in Democratic presidential support ( $R^2 = 0.24$ ).

One non-racial explanation for the correlation between Racially Charged Search Rate<sub>*j*</sub> and (%Obama2008 – %Kerry2004)<sub>*j*</sub> might be that areas with high racially charged search rates were trending Republican, from 2004 to 2008, for reasons other than the race of the

**Table 4**  
Predictors of an area's racially charged search rate.

	Dependent variable: Racially Charged Search Rate			
	(1)	(2)	(3)	(4)
Percent age 65 or older	6.884* (3.650)	3.341 (3.447)	6.492* (3.668)	3.757 (3.495)
Percent w/ bachelor's degree	-9.309*** (2.105)	-8.532*** (2.147)	-10.104*** (2.004)	-9.459*** (2.129)
Percent Hispanic	-2.620*** (0.462)	-2.298*** (0.554)	-2.659*** (0.454)	-2.297*** (0.486)
Percent Black	2.556*** (0.826)	0.283 (1.268)	11.245*** (2.158)	6.734** (3.172)
(Percent Black)-squared			-24.731*** (5.613)	-16.517*** (6.070)
Observations	196	196	196	196
R-squared	0.36	0.49	0.41	0.50
Census div. FE		X		X

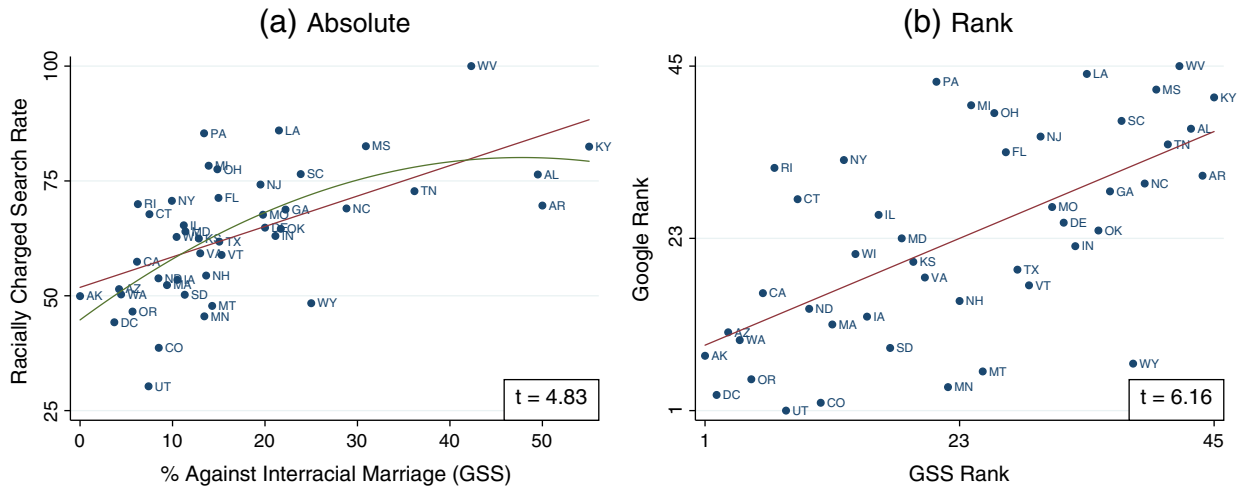
*Notes:* Standard errors, clustered at the state level, are in parentheses. Racially Charged Search Rate is as defined in Eq. (1), obtained by the algorithm described in Appendix C, normalized to its z-score. The demographic variables are individuals in the group divided by total individuals; thus a one-unit change represents a change from 0 to 100%. The demographic variables are from the American Community Survey '05–'09. All county-level variables are aggregated to the media market level using Gentzkow and Shapiro (2008).

\*  $p < 0.1$ .  
\*\*  $p < 0.05$ .  
\*\*\*  $p < 0.01$ .

<sup>18</sup> Calculations on perceived ideology are the author's calculations using ANES data. There were slightly larger differences in perceived ideology of the Republican candidates. Roughly 59% viewed George W. Bush as conservative or very conservative in 2004; 46% viewed John McCain as conservative or very conservative in 2008.

<sup>19</sup> Bush's approval rating from October 17–20, 2008 was the lowest for any president in the history of the NBC News–Wall Street Journal tracking poll (Hart/McInturff, 2012). He was nearly twice as popular in the run-up to the 2004 election as in the run-up to the 2008 election (Gallup, 2012). Modern political elections are considered, in large part, a referendum on the current administration, even if the incumbent candidate is not running; Obama consistently attempted to tie McCain to the unpopular Bush (Jacobson, 2009).

<sup>20</sup> There are 210 media markets in the United States. Ten of the smallest media markets do not have large enough search volume for “weather” and thus are not included. Two additional small media markets (Juneau and Twin Falls) search “weather” much more frequently than other media markets. Since they often score 100 on both “weather” and “weather” or the racial epithet, I cannot pick up their racial animus from the algorithm. Alaska changed its vote reporting boundaries from 2004 to 2008. I was unable to match the media market data with the boundaries for Alaskan media markets. I do not include data from Alaska. Overall, the 196 media markets included represent 99.3% of voters in the 2004 election. All of the summary statistics in Table 5 are virtually identical to summary statistics over the entire population of the United States.



**Fig. 3.** Google racially charged search compared to GSS opposition to interracial marriage. *Notes:* The x-axis in panels (a) is the measure of racial attitudes used in Mas and Moretti (2009): percent of whites, from 1990 to 2004, supporting a law banning interracial marriage. The x-axis in panel (b) is the rank of the 45 states for this measure, with higher numbers corresponding to higher measures of racial prejudice. Thus, the value 45 in Panel (b) means that state (Kentucky) had the highest percentage of whites telling the GSS they supported a law banning interracial marriage. The y-axis for panel (a) uses the unrounded number in Table A.1 for the 45 states for which GSS data are available; The y-axis panel (b) is the rank of racially charged search for these 45 states, with higher numbers corresponding to higher racially charged search rates.

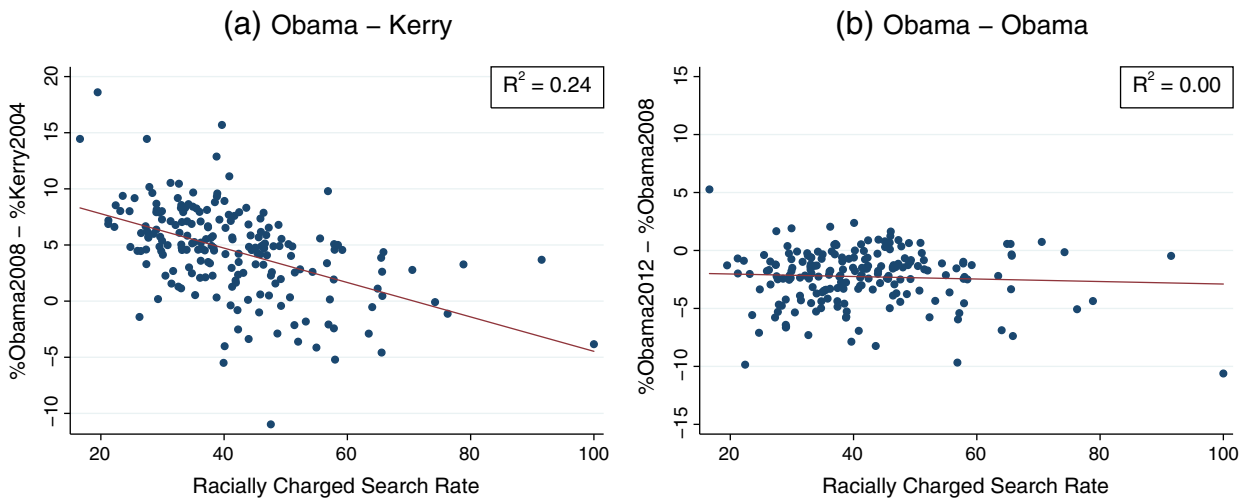
candidates. Data using other measures of changing liberalism offer evidence against this interpretation.

Panel (a) of Fig. 5 shows no relationship between states' racially charged search and changes in states' liberalism, from 2004 to 2008, as measured by Berry et al. (1998). Fig. 5, Panel (b), shows a small, and not significant, negative correlation between media markets' racially charged search and change in Democratic support in House races from 2004 to 2008. (In results shown later, I find that racial animus affected turnout, likely explaining the small relationship with House voting.) Using exit poll data in 2004 and 2008, there is no relationship between racially charged search rate and change in black self-reported support for Obama relative to Kerry ( $R^2 = 0.00$ ); the relationship is driven entirely by white voters ( $R^2 = 0.28$ ).

Furthermore, if the correlation were due to changing partisan preferences correlated with racially charged search rate, other Democratic presidential candidates would have been equally punished in areas with high racially charged search rates around this time period. However, I examine data from SurveyUSA, first used by Donovan (2010), on

hypothetical presidential match-ups. I can test whether, matched up against the same Republican candidate, Obama does worse than other Democratic candidates, among white voters, in areas with higher racially charged search. In February 2008, hypothetical match-ups were performed between Hillary Clinton and McCain and Obama and McCain in 50 states. Among white voters, Obama receives significantly smaller vote shares than Clinton in states with higher racially charged search rate ( $t = -9.05$ ;  $R^2 = 0.49$ ). In late September and early October 2007, in 17 states, hypothetical match-ups were performed between John Edwards and three Republican candidates and Obama and the same three Republican candidates. Among white voters, for all three match-ups, Obama receives significantly smaller vote shares than Edwards in states with higher racially charged search rate (Fred Thompson:  $t = -3.49$ ,  $R^2 = 0.45$ ; Rudy Guiliani:  $t = -2.20$ ,  $R^2 = 0.24$ ; Mitt Romney:  $t = -3.48$ ,  $R^2 = 0.45$ ).

Reported voting data are never ideal. However, the results of the alternate match-ups, combined with the race-specific exit polls results, combined with the House voting results, strongly suggest that



**Fig. 4.** Racially charged search rate and black candidate support. *Notes:* The x-axis in both panels is a media market's racially charged search rate, as defined in Eq. (1), obtained by the algorithm described in Appendix C. The y-axis in Panel (a) is Kerry's 2004 percentage points of the two-party vote subtracted from Obama's 2008 percentage points of the two-party vote. The y-axis in Panel (b) is Obama's 2008 percentage points of the two-party vote subtracted from Obama's 2012 percentage points of the two-party vote.

**Table 5**  
Summary statistics.

	Mean	SD	Min	Max
Racially Charged Search Rate	39.78	9.21	16.62	100.00
%Kerry2004	48.83	9.57	19.89	70.06
%Obama2008	53.76	10.18	22.16	75.05
%Obama2012	52.04	11.03	19.66	76.87
%Obama2008 – %Kerry2004	4.93	3.18	–10.98	18.60
%Obama2012 – %Obama2008	–1.72	2.03	–10.61	5.27
%HouseDems2008 – %HouseDems2004	7.26	8.74	–39.16	72.59
ln(Turnout2008) – ln(Turnout2004)	0.07	0.06	–0.10	0.25

Notes: All summary statistics are reported for the 196 media markets for which data on Racially Charged Search Rate and voting data are available. All summary statistics reported are weighted by the 2004 two-party turnout, the weighting used in Tables 6 and 9. Racially Charged Search Rate is as defined in Eq. (1), obtained by the algorithm described in Appendix C, normalized to its z-score. All candidate variables are that candidate's percentage points of two-party votes in a given year. Turnout is total two-party presidential votes in a given year. All political variables were downloaded at the county level and aggregated to the media market level using Gentzkow and Shapiro (2008).

decreased support for Obama in areas with high racially charged search rate is caused by white voters supporting Obama less than they would a white Democrat.

I now return to administrative vote data at the media market level and examine the relationship more systematically using econometric analysis. I add a number of controls for other potential factors influencing voting. I do not find evidence for an omitted variable driving the negative correlation between a media market's racially charged search rate and its preference for Obama compared to Kerry. The empirical specification is

$$(\%Obama2008 - \%Kerry2004)_j = \beta_0 + \beta_1 \cdot \text{Racially Charged Search Rate}_j + X_j \phi^1 + \mu_j \quad (2)$$

where  $X_j$  are area-level controls that might otherwise influence change in support of the Democratic presidential candidate from 2004 to 2008;  $\beta_0$  is a country-wide shock to Democratic popularity in 2008; and  $\mu_j$  is noise.

Racially Charged Search Rate<sub>j</sub> is as described in Eq. (1), normalized to its z-score. Thus, the coefficient  $\beta_1$  measures the effect of a one standard deviation increase in Racially Charged Search Rate<sub>j</sub> on Obama's vote share. All regressions predicting voting behavior, unless otherwise noted, are weighted by the 2004 total two-party votes. All standard errors are clustered at the state level.<sup>21</sup>

The results are shown in Table 6. All columns include two controls known to consistently influence Presidential vote choice (Campbell, 1992). I include Home State<sub>j</sub>, a variable that takes the value 1 for states Illinois and Texas; –1 for states Massachusetts and Arizona; 0 otherwise.<sup>22</sup> I also include proxies for economic performance in the run-up to both the 2004 and 2008 elections: the unemployment rates in 2003, 2004, 2007, and 2008.

Column (1), including just the standard set of controls, shows that a one standard deviation increase in a media market's racially charged search rate is associated with 1.5 percentage points fewer Obama votes. Column (2) adds controls for nine Census divisions. Any omitted variable is likely to be correlated with Census division. Thus, if omitted variable bias were driving the results, the coefficient should drop substantially upon adding these controls. The coefficient, instead, remains the same. Column (3) adds a set of demographic controls: percent Hispanic; black; with Bachelor's degree; aged 18–34; 65 or older; veteran; and gun magazine subscriber; as well as changes in percent black and percent Hispanic. Since there is some measurement error in the

<sup>21</sup> For the purposes of clustering, for media markets that encompass more than one state, I use the state in which the highest percentage of residents live.

<sup>22</sup> Since I run the regressions at the media market level and some media markets overlap states, I aggregate Home State<sub>j</sub> from the county level, weighting by 2004 turnout. For the Chicago media market, as an example, Home State = 0.92, as some counties in the media market are in Indiana.

Google-based proxy of racial animus, one would expect the coefficient to move towards zero as these controls are added. It does. However, the change is not particularly large (less than a 10% decline in magnitude) considering the number of controls. The stability of the coefficient to a rich set of observable variables offers strong evidence for a causal interpretation (Altonji et al., 2005).<sup>23</sup>

### 3.1.1. Adding Google controls to reduce measurement error

There is not a one-to-one correspondence between an individual's propensity to type the racial epithet into Google and his or her racial animus. Individuals may type the epithet for a variety of reasons other than animus. Individuals harboring racial animus may express it in different ways – either on different search engines or offline.

Any motivations of searches of the word unrelated to animus that do not differ at the area level will not create any bias in the area-level proxy. However, alternative motivations that differ at the area level will lead to measurement error in the area-level proxy. Classical area-level measurement error will cause attenuation bias in the estimates in Columns (1)–(3) of Table 6. In Columns (4)–(6), I reproduce the results from Columns (1)–(3) but add controls for an area's search rates for other words correlated with the search term unlikely to express racial animus. This should reduce measurement error in the proxy.

Row (8) of Table 2 shows that some searchers are looking for information on the word. I add a control for “African American(s)” search rate to proxy an area's interest in information related to African-Americans. Since a small percentage of searches for the word ending in “er” are looking for particular cultural references, I add a control for “nigga(s)” search rate. Finally, as some areas may be more prone to use profane language on Google, I add a control for an area's search rate for profane language.<sup>24</sup> Columns (4)–(6) show that the coefficient is more negative in each specification when adding the Google controls.

### 3.1.2. The cost of racial animus on an incumbent black presidential candidate: evidence from 2012

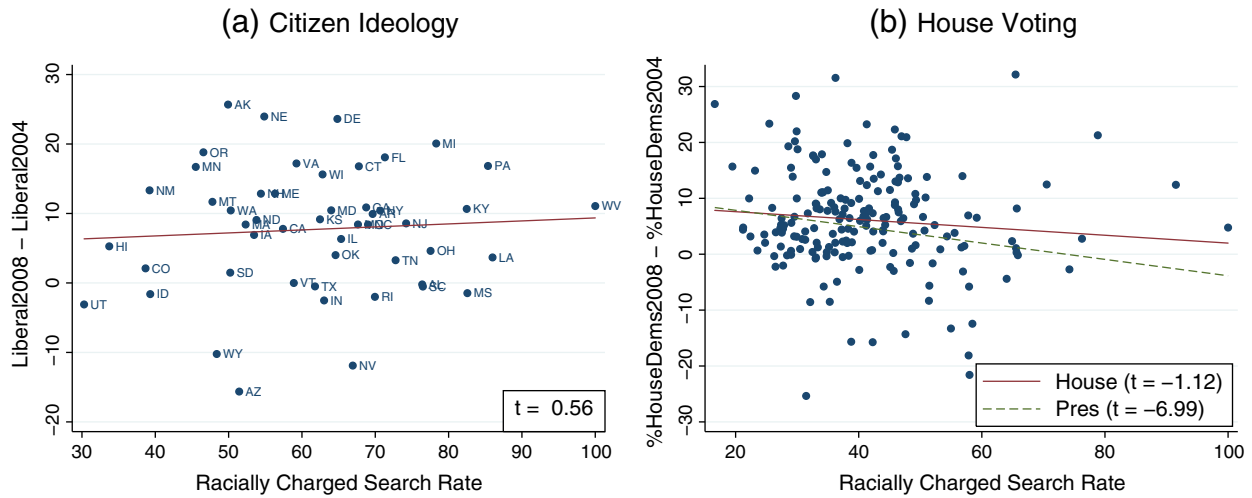
Previously, it was found that racially charged search rate significantly predicts Barack Obama's 2008 vote share, controlling for John Kerry's 2004 control. The robustness of the result is evidence of a causal effect of racial animus on Obama.

Was there a similar effect of racial animus on Obama in his second run for president, in 2012? Fig. 4, Panel (b), shows graphical evidence that the answer is yes. It compares an area's racially charged search rate to the change in Obama's two-party vote share, from 2008 to 2012. If racial animus played a bigger (smaller) role in 2012 than in 2008, we would expect the relationship to be negative (positive). Instead, racially charged search rate shows no correlation with the change in Obama's 2008 and 2012 vote shares. This suggests that race played a similar role in 2008 and 2012.

Note, too, that the result in Panel (b), the null relationship between racially charged search rate and change in Obama support, from 2008 to 2012, further supports the causal explanation of Panel (a), the negative relationship between racially charged search rate and change in Kerry 2004 to Obama 2008 support. In particular, the null relationship argues against two alternative explanations. If the negative correlation between racially charged search rate and change in Democratic support from 2004 to 2008 were picking up a trend away from Democratic support in places with high racially charged search rates, one would expect this trend to continue and there to again be a negative correlation in Panel (b). Another, non-causal explanation for the result in Panel (a) is that, by chance, racially charged search rate correlated with random noise in 2008 vote shares. Bias towards finding, and reporting, significant results led to this relationship being found. If this were the case,

<sup>23</sup> When allowing for a more flexible relationship between the dependent variable and racially charged search rate, I consistently found that a linear relationship fit best.

<sup>24</sup> Following my general strategy of selecting the most salient word if possible, I use the word “[Word 3].”



**Fig. 5.** Change in liberalism (2004–2008) and racially charged search rate. *Notes:* The x-axis in Panel (a) is the unrounded value from Table A.1. The x-axis in panel (b) is the number used in Fig. 4. The y-axis in Panel (a) measures change in liberalism, from 2004 to 2008, according to the “revised 1960–2008 citizen ideology series.” This commonly used proxy is described in Berry et al. (1998). To construct the y-axis variable for Panel (b), counties are dropped if either major party received 0 vote in House elections in 2004 and/or 2008. Vote totals are aggregated for remaining counties to the media market level, using Gentzkow and Shapiro (2008), and the difference in the two-party share for Democrats is calculated. The dotted line shows the best linear fit of points (not shown) between the difference in Obama 2008 and Kerry 2004 vote shares and racially charged search rate, over the same, limited, ‘unopposed’ sample. The relationship between racially charged search rate and changing Democratic House support using all races, not just races fielding candidates from both major parties, is not significant, either. However, standard errors are much larger.

there should be regression to the mean and a positive correlation in Panel (b). The lack of a significant relationship, instead, adds additional evidence that the correlation in Panel (a) is due to areas with high racially charged search rate punishing Obama.

Table 7 examines 2012 data more systematically. Panel (a) reproduces the six regression results from Table 6, presenting the identical coefficient on racially charged search rate as shown in the corresponding column in Table 6. Panels (b) and (c) of Table 7 introduce different dependent variables. In Panel (b), the dependent variable is %Obama2012 - %Obama2008. This, thus, expands the exercise performed in Fig. 4, Panel (b). In Panel (c) of Table 7, the dependent variable is %Obama2012 - %Kerry2004. Comparing coefficients in Panel (c) and Panel (a), thus, can be thought of as comparing the size of the effect of racial prejudice in 2008 and 2012.

The regressions in Panel (b) and Panel (c) use the same demographic and Google controls as in Panel (a). However, I use different standard controls to reflect the different election conditions.<sup>25</sup> Panel (b) of Table 7 shows that, upon adding the controls, there still is not a significant relationship between racially charged search rate and change in Obama support, from 2008 to 2012. This confirms the robustness of the null result of Fig. 4, Panel (b). The null result in Panel (b) suggests that racial prejudice played a similar role in 2008 and 2012. Indeed, the coefficients in Panel (c) are roughly similar to the corresponding coefficients in Panel (a).

To summarize, racially charged search rate is a similar predictor of Obama’s performance in both 2008 and 2012. In addition, the flat relationship between racially charged search rate and change in Democratic support, from 2008 to 2012, further supports a causal interpretation of the negative relationship between racially charged search rate and change in Democratic support, from 2004 to 2008.

### 3.1.3. Robustness checks

Table 8 presents a number of robustness checks. Obama received about 20 percentage points more of the two-party vote share in Hawaii

<sup>25</sup> The standard controls for Panel (b) are: a dummy variable Home State that takes the value 1 for Arizona and -1 for Massachusetts; and the unemployment rates in 2007, 2008, and 2011. In Panel (c), the standard controls are a dummy variable Home State that takes the value of 1 for Illinois and Texas and -2 for Massachusetts; and the unemployment rates in 2003, 2004, and 2011.

than Kerry did. Obama was born in Hawaii. Excluding Hawaii, though, changes the coefficient towards zero by less than 5%. The coefficient is of a similar magnitude including changes in House Democratic support from 2004 to 2008 and swing state status.<sup>26</sup>

The main specification requires a somewhat restrictive relationship between Obama and Kerry’s vote share. This, though, is not driving the result. The results are of similar magnitudes instead using %Obama<sub>j</sub> as the dependent variable and including %Kerry2004<sub>j</sub> as an independent variable, and they are of similar magnitudes using %Obama<sub>j</sub> as the dependent variable and including a 4th-order polynomial for %Kerry<sub>j</sub> as independent variables. Including this polynomial allows for liberal areas to differ from conservative areas in their relative support for Obama and Kerry. The fact that the coefficient on racially charged search rate is unchanged (perhaps not surprising since racially charged search rate is not significantly correlated with liberalism and voters perceived the candidates as having similar ideologies) offers additional evidence that racial attitudes, not ideology, explain the results. The coefficients are also very similar including trends in presidential Democratic support.

### 3.2. The effects of racial animus on turnout in a biracial election

There is also a literature exploring the effects of race on turnout. In a classic paper, Washington (2006) finds that turnout increases 2–3 percentage points in biracial Senate, House, and Gubernatorial elections.

Was some of the effects of racial animus found in the previous section due to white voters motivated to turnout to oppose a black candidate?

I first use the area-level proxy of racial animus to test the average effect of prejudice on turnout. I regress

$$(\ln(\text{Turnout2008}) - \ln(\text{Turnout2004}))_j = \delta_0 + \delta_1 \cdot \text{Racially Charged Search Rate}_j + Z_j \phi^2 + \psi_j \quad (3)$$

where  $(\ln(\text{Turnout2008})) - \ln(\text{Turnout2004}))_j$  is the change in the natural log of the total Democratic and Republican votes from 2004 to 2008;  $Z_j$  is a set of controls for other factors that might have changed

<sup>26</sup> I do not include these controls in the main specifications as they could be affected by Obama support and thus not exogenous.



**Table 6**

The effect of racial animus on black candidate vote share.

	Dependent variable: %Obama2008 – %Kerry2004					
	(1)	(2)	(3)	(4)	(5)	(6)
Racially Charged Search Rate	–1.490*** (0.305)	–1.486*** (0.258)	–1.341*** (0.260)	–2.124*** (0.435)	–2.002*** (0.259)	–1.776*** (0.304)
Home state	2.616*** (0.804)	4.234*** (1.118)	3.556*** (1.107)	2.481*** (0.854)	4.070*** (1.141)	3.636*** (0.996)
Observations	196	196	196	196	196	196
R-squared	0.26	0.51	0.62	0.30	0.52	0.62
Standard controls	X	X	X	X	X	X
Census div. FE		X	X		X	X
Demographic controls			X			X
Google controls				X	X	X

Notes: Standard errors, clustered at the state level, are in parentheses. OLS regressions are weighted by total two-party presidential votes in the 2004 election. Racially Charged Search Rate is as defined in Eq. (1), obtained by the algorithm described in Appendix C, normalized to its z-score. Home State takes the value 1 for Illinois and Texas; –1 for Massachusetts and Arizona; 0 otherwise. Standard controls are Home State and unemployment rates in years 2003, 2004, 2007, and 2008 (from Local Area Unemployment Statistics). Demographic controls are percent African-American, percent Hispanic, percent with bachelor's degree, percent 18–34, percent 65+, and percent veteran (from American Community Survey '05-'09); change from 2000 to 2010 in percent African-American and percent Hispanic (from the Census); and gun magazine subscriptions per capita (from Duggan (2001)). All county-level variables are aggregated to the media market level using Gentzkow and Shapiro (2008). Google controls are normalized search volume for "African-American(s);" "[Word 2](s);" and "[Word 3]".

\*  $p < 0.1$ .\*\*  $p < 0.05$ .\*\*\*  $p < 0.01$ .

turnout and Racially Charged Search Rate<sub>*j*</sub> is as described in Eq. (1), normalized to its z-score.

The results are shown in Columns (1) through (3) of Table 9. In all specifications, I include percent black and change in the natural log of an area's population from 2000 to 2010. Column (2) adds Census fixed effects. Column (3) adds the same demographic controls used in the vote share regressions in Table 6. In none of the specifications is there a significant relationship between racially charged search rate and turnout. I can always reject that a one standard deviation increase in racially charged search rate – which lowers Obama's vote share by 1.5 to 2 percentage points – changes turnout by 1% in either direction. This allows us to reject a countrywide effect of racial animus as large as the effect found in Washington (2006).

Does this mean that race did not affect white turnout in the election? No. There are two ways that racial animus might affect turnout in a bi-racial election. First, white Republicans harboring racial animus who

usually stay home may be motivated to oppose a black candidate. Second, white Democrats harboring racial animus who usually vote may be motivated to stay home rather than support a black candidate. These effects may cancel out.

If these effects do operate, there is a clear prediction. Increased racial animus should increase turnout in parts of the country with lots of Republicans. It should decrease turnout in parts of the country with lots of Democrats.

I add to the independent variables in Columns (1) to (3) of Table 9 the interaction between an area's percent Democrats and racially charged search rate. If racial attitudes affect some individuals' decisions of whether or not to vote, I expect the following: it should increase turnout when there are few Democrats in an area. (There are few Democrats available to stay home due to racial prejudice.) The effect of racial prejudice on turnout should be decreasing as the percentage of the population that supports Democrats increases.

**Table 7**

The effect of racial animus: 2008 compared to 2012.

	(1)	(2)	(3)	(4)	(5)	(6)
(a) Dependent variable: %Obama2008 – %Kerry2004						
Racially Charged Search Rate	–1.490*** (0.305)	–1.486*** (0.258)	–1.341*** (0.260)	–2.124*** (0.435)	–2.002*** (0.259)	–1.776*** (0.304)
(b) Dependent variable: %Obama2012 – %Obama2008						
Racially Charged Search Rate	0.096 (0.276)	–0.146 (0.287)	–0.027 (0.284)	–0.401 (0.285)	–0.283 (0.311)	0.048 (0.333)
(c) Dependent variable: %Obama2012 – %Kerry2004						
Racially Charged Search Rate	–1.423*** (0.467)	–1.896*** (0.425)	–1.377*** (0.284)	–2.551*** (0.577)	–2.427*** (0.469)	–1.706*** (0.457)
Observations	196	196	196	196	196	196
Standard Controls	X	X	X	X	X	X
Census div. FE		X	X		X	X
Demographic controls			X			X
Google controls				X	X	X

Notes: Panel (a) reproduces the six coefficients on Racially Charged Search Rate corresponding to the six coefficients on Racially Charged Search Rate in Table 6. Panel (b) presents the coefficients on Racially Charged Search Rate for the same regressions as those used in Panel (a), with a different dependent variable and changed standard controls to adjust for different election conditions. The dependent variable is Obama's two-party vote share in 2012 minus Obama's two-party vote share in 2008. Standard controls are Home State, which takes the value –1 for Massachusetts; 1 for Arizona; 0 otherwise and the unemployment rates in 2011, 2007, and 2008 (from Local Area Unemployment Statistics). Google and Demographics controls are identical to those used in Panel (a) and are listed in Table 6. For Panel (c), the dependent variable is Obama's two-party vote share in 2012 minus Obama's two-party vote share in 2004. Standard controls are Home State, which takes the value –2 for Massachusetts; 1 for Illinois; 1 for Texas; 0 otherwise; and unemployment rates in 2011, 2003, and 2004 (from Local Area Unemployment Statistics). Google and Demographics controls are identical to those used in Panel (a) and are described in Table 6. Standard errors, clustered at the state level, are in parentheses. OLS regressions are weighted by total two-party presidential votes in the 2004 election.

**Table 8**  
Robustness checks.

Specification	2008 coefficient	2012 coefficient
Baseline (all controls; Table 7, column (6))	−1.776 (0.304)	−1.706 (0.304)
Exclude Hawaii	−1.553 (0.230)	−1.463 (0.411)
Add control for change in house voting	−1.699 (0.284)	−1.610 (0.452)
Add control for swing state	−1.779 (0.317)	−1.647 (0.442)
Use %Obama as dependent variable and include control for %Kerry2004	−1.682 (0.285)	−1.661 (0.460)
Use %Obama as dependent variable and include 4th-order polynomial %Kerry2004	−1.648 (0.293)	−1.628 (0.478)
Add control for %Kerry2004 − %Gore2000	−1.775 (0.312)	−1.694 (0.439)
Add controls for %Kerry2004 − %Gore2000 and %Gore2000 − %Clinton1996	−1.731 (0.329)	−1.642 (0.453)
Use %Obama as dependent variable and include %Kerry2004, %Gore2000, %Clinton1996	−1.577 (0.326)	−1.547 (0.459)

Notes: Standard errors, clustered at the state level, are in parentheses. Results in this table are variations on Column (6), Panels (a) and (c), reported in Table 7. Swing State status is Battleground States, as defined by *The Washington Post*, available at <http://www.washingtonpost.com/wp-dyn/content/graphic/2008/06/08/GR2008060800566.html>.

More formally, the regression is:

$$\begin{aligned}
 (\ln(\text{Turnout2008}) - \ln(\text{Turnout2004}))_j &= \alpha_0 + \alpha_1 \cdot \%Kerry2004_j \\
 &+ \alpha_2 \cdot \text{Racially Charged Search Rate}_j + \alpha_3 \cdot \text{Racially Charged Search Rate}_j \\
 &\times \%Kerry2004_j + Z_j \phi^3 + \epsilon_j
 \end{aligned}
 \tag{4}$$

where  $\text{Kerry2004}_j$  is used to proxy an area's percent Democrats.

If racial animus affected Obama vote shares, in part, through changes in turnout, I expect  $\alpha_2 > 0$  and  $\alpha_3 < 0$ .

The coefficients on  $\alpha_2$  and  $\alpha_3$  are shown in Columns (4)–(6) of Table 9. In all three specifications, corresponding to the same specifications in Columns (1)–(3),  $\alpha_2 > 0$  and  $\alpha_3 < 0$ . In areas that supported Kerry in 2004, an increase in racial animus decreased 2008 turnout. In areas that supported Bush in 2004, an increase in racial animus increased 2008 turnout. The coefficients tend to be marginally significant, and the standard errors are always too large to say anything precise.

In results not shown, I reproduce the results replacing  $(\ln(\text{Turnout2012})) - \ln(\text{Turnout2004})$ , as the dependent variable. County-level population data near or after the 2012 election are not as-of-yet available, complicating interpretation. However, preliminary results are similar, with no relationship between racially charged search

rate and turnout, on average, but a positive (negative) relationship in highly Republican (Democratic) areas.

In sum, the evidence on the effects of racial animus on turnout is as follows: Some Democrats stayed home rather than vote for Obama due to his race; a similar number of individuals who would not have otherwise voted turned out for the Republican due to Obama's race. There is not enough statistical power, though, to determine this number.

Note, too, that these results can now be reconciled with those of Washington (2006). An average black general election candidate would be expected to have won his or her primary by a larger margin than Obama won his by. We would thus expect that the average black candidate would have faced lower racial animus in his or her primary than Obama did in a country-wide Democratic primary. Thus, racial animus among Democrats is lower for the average black candidate in Washington's (2006) sample than for the country as a whole. Thus, relatively few voters would stay home in the general election rather than support the black candidate in the average election in Washington's (2006) sample.

#### 4. Interpretation

Section 4 compares Google racially charged search rate to changing voting patterns from the 2004 all-white presidential

**Table 9**  
Change in turnout (2004–2008) and racially charged search rate.

	Dependent variable: $\ln(\text{Turnout2008}) - \ln(\text{Turnout2004})$					
	(1)	(2)	(3)	(4)	(5)	(6)
Racially Charged Search Rate	−0.001 (0.005)	−0.001 (0.005)	0.004 (0.005)	0.025** (0.013)	0.032* (0.017)	0.033* (0.017)
Racially Charged Search Rate · %Kerry2004				−0.056** (0.028)	−0.071* (0.039)	−0.064* (0.039)
Observations	196	196	196	196	196	196
R-squared	0.67	0.73	0.80	0.67	0.74	0.80
Census div. FE		X	X		X	X
Demographic controls			X			X

Notes: Standard errors, clustered at the state level, are in parentheses. OLS regressions are weighted by total two-party presidential votes in the 2004 election. Dependent variable in all specifications is the natural log of two-party presidential votes in 2008 minus the natural log of two-party presidential votes in 2004. Racially Charged Search Rate is as defined in Eq. (1), obtained by the algorithm described in Appendix C, normalized to its z-score. All regressions include change in log population from 2000 to 2010 (from the Census); percent African-American (from American Community Survey '05–'09); and Kerry's share of the two-party vote. Columns (3) and (6) add percent African-American, percent Hispanic, percent with bachelor's degree, percent 18–34, percent 65+, and percent veteran (from American Community Survey '05–'09); change from 2000 to 2010 in percent African-American and percent Hispanic (from the Census); and gun magazine subscriptions per capita (from Duggan (2001)). All county-level variables are aggregated to the media market level using Gentzkow and Shapiro (2008).

\*  $p < 0.1$ .  
\*\*  $p < 0.05$ .  
\*\*\*  $p < 0.01$ .

**Table 10**  
Country-wide effect: Google compared to other measures.

Source	Obs	Measure	Controls	2008 cost	2012 cost
Google	196 media markets	Racially Charged Search Rate, '04-'07	Standard	3.5 (0.7)	3.3 (1.1)
			Standard + Census	3.5 (0.6)	4.4 (1.0)
			Standard + Census + Demogs	3.1 (0.6)	3.2 (0.9)
			Standard + Google	5.0 (1.0)	6.0 (1.3)
			Standard + Google + Census	4.7 (0.6)	5.7 (1.1)
			Standard + Google + Census + Demogs	4.2 (0.7)	4.0 (1.1)
			GSS	45 states	% against interracial marriage, '90-'04
		Average prejudice, '72-'04	Standard	0.6 (1.3)	2.1 (1.3)
			Standard + Census	2.8 (1.1)	3.0 (1.0)
			Standard + Census	0.5 (1.6)	2.0 (1.9)
ANES	Individual	Explicit prejudice	Piston (2010)	2.3 (1.0)	
APYN		Explicit + implicit prejudice	Pasek et al. (2010)	2.7	
CCES		Racial salience	Schaffner (2011)	2.0	

Notes: This table compares the results obtained using the Google data to those using the same specification but measures from the GSS and the estimate obtained by other scholars using individual proxies for racial attitudes and individual reported votes. For all regressions used to calculate the estimated percentage points using Google or GSS, the regressions are weighted by total two-party presidential votes in 2004. The point estimate is then the country-wide effect of moving from the area with the lowest value. Controls are those reported in Table 7. The first GSS measure is from Mas and Moretti (2009). The second GSS measure is from Charles and Guryan (2008). Piston (2010) finds that overall prejudice cost Obama 2.66% of the white vote. Assuming that whites accounted for 87% of the electorate yields the number of 2.3. For the GSS regressions, robust standard errors are shown. For the Google regressions, standard errors clustered at the state-level are shown.

election to the 2008 and 2012 biracial presidential elections and finds that racial animus played a significant role in the 2008 and 2012 elections. Section 3.1 shows the main result of this paper: racially charged search rate is a robust negative predictor of Obama's vote share. Section 3.2 shows that higher racially charged search rate predicts increased turnout in Republican parts of the country; decreased turnout in Democratic parts of the country; and, on average, no change in turnout. This section aims to give some intuition to the magnitude of the effects of racial attitudes on presidential voting.

How many additional votes would Obama have received if the whole country had the racial attitudes of the most tolerant areas? Media markets' mean racially charged search rate is 2.34 standard deviations higher than the minimum racially charged search rate. Table 10 shows the estimated vote shares from different specifications, assuming that no votes were lost in the media market with the lowest racially charged search rate. In 2008, the estimated loss ranges from 3.1 percentage points to 5.0 percentage points.<sup>27</sup> The specification including the full set of controls – Google controls, demographics controls, and Census Division fixed effects, gives a point estimate of 4.2 percentage points. In 2012, the estimated loss ranges from 3.2 percentage points to 6.0 percentage points. The specification that includes the full set of controls yields a point estimate of 4.0 percentage points.

The effects of racial animus on a black compared to a white Democratic candidate can be compared to voters' well-established

comparative preference for a home state compared to a non-home-state candidate.<sup>28</sup> Studies show, on average, that voters will reward a candidate from their own home-state with about four percentage points of the two-party vote (Lewis-Beck and Rice, 1983; Mixon and Matthew Tyrone, 2004). This is roughly consistent with the home-state advantage found in the regressions in Table 6. Racial animus gave Obama's opponent the equivalent of a home-state advantage country-wide.

While racial animus obviously did not cost Mr. Obama the 2008 or 2012 election, examining more elections shows that the effects of the magnitude found are often decisive. A two percentage point vote loss would have switched the popular vote winner in 30% of post-War presidential elections. A four percentage point loss would have changed more than 50% of such elections.

#### 4.1. Comparison with other methodologies

The effect of racial prejudice found by the methodology of this paper can also be compared to estimates obtained using different data sources and methodology. I find that the effects using Google data are larger than the effects found using survey-based methodologies. The most similar paper is Mas and Moretti (2009). Comparing the GSS to aggregate voting data in the 2008 and 2004 elections, they argue that race was not a major factor against Obama. This paper's methodology is slightly different from the one used in Mas and Moretti (2009). Mas and Moretti (2009) predict a county's Democratic vote share in 2004 and 2008 House and presidential elections from a set of dummy

<sup>27</sup> In estimates using the Google controls, multiplying the coefficient by 2.34 yields an approximation of the true effect. This would be biased upwards if measurement error substantially lowered the measured minimum racial animus. I do not find this is the case. I calculate a new measure of racial animus as the difference in racially charged search relative to predictions from all the controls in Column (4) of Table 6. This still leaves Loredo, TX as having the minimum value. Regressing the dependent variable – the difference between Obama and Kerry support – on this measure of racial animus and multiplying the coefficient on the regression by the difference between the mean and the minimum of the measure always yields roughly the same result.

<sup>28</sup> I interpret the results in this paper as the effects of racial animus. An alternative explanation is that this reflects racial attitudes more broadly, with perhaps the Google search proxy correlating with other types of prejudice, such as implicit prejudice. My interpretation is based on: how common the searches are; the clear interpretation of searches as animus; the fact that it is not clear how correlated an area's implicit prejudice and animus are; and some research using individual data that do not find implicit prejudice an important factor when controlling for admitted explicit prejudice (compare, for example, Piston (2010) to Pasek et al. (2010) and see Kinder and Ryan (2012)). When area-level averages for implicit prejudice are available, this interpretation can be further tested.

variables (Year = 2008; Election Type = presidential; Election Type = presidential & Year = 2008) and an interaction between a state's GSS racial attitudes and the dummy variables. This specification makes it difficult to pick up the effects of racial attitudes on voting for Obama since House elections are high-variance (sometimes, one of the two major parties does not field a candidate, dramatically shifting the Democratic proportion of vote share). A large swing in House voting can falsely suggest a large trend in Democratic voting.<sup>29</sup>

Nonetheless, I do confirm that effects using the GSS measures and the specification of this paper yield a smaller effect and are less robust. Table 10 compares the estimates obtained using the Google measure and the specification of this paper to estimates using GSS measures and the specification of this paper. Using either the measure from Mas and Moretti (2009) or Charles and Guryan (2008) always yields smaller estimates of the country-wide effect. The effect picked up using the GSS data is largely due to a few Southern states which measure high on racial prejudice and also voted for Obama significantly less than they voted for Kerry. In contrast to regressions using the Google measure, where the effect is robust to including Census division fixed effects, regressions using the GSS measures tend to lose significance when including the Census division fixed effects.<sup>30</sup> Furthermore, I find that the preferred fit with the GSS measures is quadratic. The fit suggests no effect in just about all parts of the country but an effect in a few southern states. The GSS is ineffective at capturing racial prejudice in all but a few Southern states. Google is also advantageous relative to the GSS in testing for causality: observations from large samples from 196 media markets allows for a rich set of controls and robustness checks, as shown in Tables 6, 7 and 8; this is not possible with 45 state-level observations.

The final row of Table 10 includes the estimates from Piston (2010), Schaffner (2011), and Pasek et al. (2010).<sup>31</sup> Each uses individual data and obtains a smaller preferred point estimate. This suggests individual surveys underestimate the true effect of racial attitudes.

There are additional advantages to the empirical specification of this paper relative to studies using individual-level surveys in testing for causality, besides the likely improved measure of racial animus. Individual survey studies rely exclusively on self-reported voting; vote misreporting may be a substantial issue with survey data (Atkeson, 1999; Wright, 1993; Ansolabehere and Hersh, 2011). Further, their measures of racial attitudes are taken from near the election. They thus could potentially pick up reverse causation. Finally, studies testing the effects of racial attitudes on political attitudes have been criticized for omitted variable bias from unmeasured conservative ideology (Schuman, 2000; Feldman and Huddy, 2005; Huddy and Feldman, 2009). This is both because the measures of prejudice, such as whether African-Americans should overcome prejudice "without any special favors," might be

connected to conservative ideology and self-reported vote choices in previous elections are even more unreliable than self-reported vote choices in current elections. Thus, individual-level, non-panel studies can only control for self-reported ideology and political beliefs. The empirical specification of this paper, using the unambiguous measure of racial animus and controlling for administrative vote data from a similar election four years earlier, does not seem open to this critique.

#### 4.2. Pro-black effect

I find that, relative to the attitudes of the most racially tolerant area, racial animus cost Obama between 3 to 5 percentage points of the national popular vote. Obama, though, also gained some votes due to his race. Was this factor comparatively large?

A ballpark estimate from increased support from African-Americans can be obtained from exit poll data. In 2004, 60.0% of African-Americans reported turning out, 89.0% of whom reported voting for John Kerry. In 2008, 64.7% of African-Americans reported turning out, 96.2% of whom reported supporting Barack Obama. Assuming that these estimates are correct and, with a white Democrat, black support would have been the same as in 2004, increased African-American support added about 1.2 percentage points to Obama's national popular vote total in 2008.<sup>32</sup> Reported turnout data are not yet available for 2012, though exit polls suggest that African-Americans turned out at similar rates in 2012 as they did in 2008. The pro-black effect was limited by African-Americans constituting only 12.6% of Americans and overwhelmingly supporting any Democratic candidate.

A variety of evidence suggests that few white voters swung, in the general election, for Obama due to his race. Only 1% of whites said that race made them much more likely to support Obama in 2008 (Fretland, 2008). In exit polls, 3.4% of whites did report both voting for Obama and that race was an important factor in their decision, but the overwhelming majority of these voters were liberal, repeat voters likely to have voted for a comparable white Democratic presidential candidate.<sup>33</sup> Furthermore, Piston (2010) finds no statistically significant relationship, among white voters, between pro-black sentiment and Obama support, when controlling for ideology. Although social scientists strongly suspect that individuals may underreport racial animus, there is little reason to suspect underreporting of pro-black sentiment. Finally, in unreported results, I add an area's search rate for "civil rights" to the regressions in Table 6. The coefficient on racially charged search rate is never meaningfully changed, and the coefficient on Civil Rights Search Rate is never statistically significant.

#### 4.3. Estimated cost of race compared to actual performance

This paper suggests a far larger vote loss from racial animus than vote gains from race. This means that Obama would have gotten significantly more votes if race were not a consideration. Is this plausible? Forecasting how many votes a president should receive, based on economic and political fundamentals, leads to a large variance of estimates. In addition, these forecasts tend not to include candidate charisma, or candidate quality more generally, which may be important (Levitt, 1994; Benjamin and Shapiro, 2009), and such forecasts do not adjust for changing composition of the electorate (Judis and Teixeira, 2004). The highly Democratic Hispanic population has grown rapidly, consistently rising from 2% of the electorate in 1992 to 10% in 2008. This

<sup>29</sup> For example, in Mas and Moretti's (2009) Fig. 4, the authors compare the difference between the change in Obama and Kerry's vote shares and the change in House voting to their measure of racial prejudice. The difficulty with this comparison is that House elections in which one party does not field a candidate will create enormous noise in the voting metric, swamping any other changes. In 2004 in Vermont, Bernie Sanders won as a highly popular left-wing independent. In 2008 in Vermont, Democrat Peter Welch won with no Republican challenger. Thus, there was a huge gain in Vermont Democratic House support from 2004 to 2008. And the difference between the change in Democratic presidential support and change in Democratic House support, from 2004 to 2008 in Vermont, is -70 percentage points. Adding this kind of noise to the Obama and Kerry difference, and having only 45 state-level GSS observations, it is unlikely that, even if the GSS measure of racial attitudes did predict opposition to Obama, this methodology could pick it up.

<sup>30</sup> Highton (2011) located an alternative data source for racial attitudes from The Pew Research Center Values Study. Over the past 20 years, Pew has asked individuals whether they approve of blacks dating whites. Aggregating 20 years of data among whites, Highton (2011) constructs a measure available for 51 states and tests the effects of racial animus on voting in the Obama election. While standard errors are still large and the point estimate is always smaller than using Google data, the Pew data source does lead to more robust estimates than the GSS data source, in part due to the six additional observations.

<sup>31</sup> A recent paper by Kam and Kinder (2012) finds that ethnocentrism was a factor against Obama. Tesler and Sears (2010a) also find an important role of anti-Muslim sentiment in evaluating Obama. Using Google data (such as searches for "Obama Muslim" or "Obama birth certificate") to further investigate this phenomenon is a promising area for future research.

<sup>32</sup> Assume that 65% of whites turned out in 2008 and 47.6% of white voters supported Obama. If African-Americans had voted as they did in 2004, Obama would have instead received  $\frac{0.126 \times 0.6 \times 0.89 + 0.874 \times 0.65 \times 0.476}{0.126 \times 0.65 + 0.874 \times 0.65} = 52.5\%$  of the two-party vote. This is likely an upper-bound, as any Democrat likely would have seen some improvement in black support due to Bush's high disapproval rating among African-Americans.

<sup>33</sup> Among the 3.4%, 87% both reported voting for the Democratic candidate in the House race and disapproving of Bush. Among this subset, only 25% reported voting for the first time. And, among such first-time voters, 60% were 18–24, possibly ineligible to vote in any prior elections.

makes every modern election cycle meaningfully more favorable towards Democrats than the previous one. In 2012, had the racial composition of the electorate been the same as it was in 2008, Obama would have lost both Ohio and Florida.

Of the nine 2008 forecasts in [Campbell \(2008\)](#), three predicted that the Democratic presidential candidate would perform at least two percentage points better than Obama did ([Lewis-Beck and Tien, 2008](#); [Lockerbie, 2008](#); [Holbrook, 2008](#)). Of the nine 2012 forecasts in [Campbell \(2012\)](#), only [Lockerbie \(2012\)](#) showed a substantial Obama underperformance (1.8 percentage points).

[Jackman and Vavreck \(2011\)](#), using polling data with hypothetical 2008 match-ups, find that an “average” white Democrat would have received about 3 percentage points more votes than Obama did. [Table 5](#) shows that House Democratic candidates received a 2.3 percentage point larger gain in 2008 relative to 2004 than Obama received relative to Kerry; the results in [Section 3.2](#) suggest that the House Democratic swing would have been even larger absent turnout effects due to Obama's race.

#### 4.4. White voters swung by racial animus

As another way of giving intuition for the magnitude of the effect, I combine the vote share results in [Section 3.1](#) with the turnout results in [Section 3.2](#). I can then estimate the percent of white voters who would have voted for a white Democrat in 2008 but did not support a black one.

The percent motivated by animus is the number of votes lost due to animus divided by the total number of whites who would have supported a Democrat absent prejudice. [Section 3.2](#) finds that turnout was unaffected, on average, by prejudice. Thus, the denominator (the percent of whites who would have supported a Democrat, absent prejudice) is the number of whites who supported Obama plus the number of votes lost due to prejudice. Exit polls suggest that 41.7% of 2008 voters and 38.1% of 2012 voters were white Obama supporters. The percent motivated by animus is estimated between  $\frac{3.1}{44.8} = 6.9$  and  $\frac{5}{46.7} = 10.7\%$  in the 2008 election and between  $\frac{3.2}{41.3} = 7.7$  and  $\frac{6.0}{44.1} = 13.6\%$  in the 2012 election. Regressions using the full set of controls imply that, among whites who would have otherwise supported a white Democratic presidential candidate, 9.1% in 2008 and 9.5% in 2012 did not support a black Democratic presidential candidate.

How do these numbers compare to what whites tell surveys? In 2008 and 2010, among whites who told the GSS that they voted for Kerry in 2004, about 3% said they would not vote for a qualified black president. Three percent of whites told Gallup that Obama's race made them much less likely to support him ([Fretland, 2008](#)). Approximately 4.8% of whites told exit pollsters they voted for McCain and race was an important factor in their vote. Evidence strongly suggests that many whites voted against Obama due to his race but did not admit that to surveys. The numbers can also be compared to other self-reported racial attitudes. In 2002, the last year that the question was asked by the GSS, 11.9% of white Democrats admitted that they favored a law banning interracial marriage.

For additional intuition on the size of the effect, the numbers can be compared to persuasion rates as calculated by media scholars. [Gerber et al. \(2009\)](#) find that *The Washington Post* persuades 20% of readers to vote for a Democrat. [Gerber et al. \(2009\)](#) report that, historically, partisan newspapers persuaded fewer than 3.4% of readers. [DellaVigna and Kaplan \(2007\)](#) find that Fox News persuades 11.6% of viewers to vote Republican. Thus, the proportion of white Democrats who will not vote for a black Democratic Presidential candidate is roughly equivalent to the proportion of Democrats who can be persuaded by Fox News to not vote for a white Democratic Presidential candidate.

## 5. Conclusion

Whether many white Americans will not vote for a black presidential candidate is perhaps the most famous problem complicated by

social desirability bias. Scholars have long doubted the accuracy of survey results on this sensitive question. I argue that Google search query data offer clear evidence that continuing racial animus in the United States cost a black candidate substantial votes.

There are many important questions on sensitive topics that may similarly be helped by Google data. In a study of measurement error in surveys, [Bound et al. \(2001\)](#) include the following sensitive behaviors as difficult to measure for surveyors due to social censoring: “the use of pugnacious terms with respect to racial or ethnic groups;” voting; use of illicit drugs; sexual practices; income; and embarrassing health conditions. Queries related to all these topics are made with striking frequency on Google.

## Appendix A. Racially charged search rate, state

**Table A.1**

Racially charged search rate, state.

Rank	State	Racially Charged Search Rate
1.	West Virginia	100
2.	Louisiana	86
3.	Pennsylvania	85
4.	Mississippi	83
5.	Kentucky	82
6.	Michigan	78
7.	Ohio	78
8.	South Carolina	76
9.	Alabama	76
10.	New Jersey	74
11.	Tennessee	73
12.	Florida	71
13.	New York	71
14.	Rhode Island	70
15.	Arkansas	70
16.	North Carolina	69
17.	Georgia	69
18.	Connecticut	68
19.	Missouri	68
20.	Nevada	67
21.	Illinois	65
22.	Delaware	65
23.	Oklahoma	65
24.	Maryland	64
25.	Indiana	63
26.	Wisconsin	63
27.	Kansas	62
28.	Texas	62
29.	Virginia	59
30.	Vermont	59
31.	California	57
32.	Maine	56
33.	Nebraska	55
34.	New Hampshire	54
35.	North Dakota	54
36.	Iowa	53
37.	Massachusetts	52
38.	Arizona	51
39.	Washington	50
40.	South Dakota	50
41.	Alaska	50
42.	Wyoming	48
43.	Montana	48
44.	Oregon	47
45.	Minnesota	46
46.	District of Columbia	44
47.	Idaho	39
48.	New Mexico	39
49.	Colorado	39
50.	Hawaii	34
51.	Utah	30

Notes: Racially Charged Search Rate is Web Search, from January 2004–December 2007, for either “nigger” or “niggers.” This data can be found here.

## Appendix B. Offensive words

**Table B.1**

Coding for offensive words.

Word	Code in text
nigger	Search Word 1
nigga	Search Word 2
fuck	Search Word 3

## Appendix C. Algorithm to determine search volume at media market level

Google Trends does not report data if the absolute level of search is below an unreported threshold. The threshold is clearly high, such that only the most common searches are available at the media market level. And search volume for “nigger(s)” is only available for a small number of media markets. To get around this, I use the following strategy: Get search volume for the word “weather.” (This gets above the threshold for roughly 200 of 210 media markets, since “weather” is a fairly common term used on Google.) Get search volume for “weather + nigger(s),” searches that include *either* “weather” or “nigger(s).” (This, by definition, gets over the threshold for the same 200 media markets, since it captures a larger number of searches.) Subtracting search volume from “weather” from search volume from “weather + nigger(s)” will give approximate search volume for “nigger(s)” for the 200 media markets. Complications arise from rounding, normalizing, and sampling.

Here is the algorithm:

Take a sample  $s$  in Google.

Let  $X$  be a set of possible searches. Denote  $X_{j,s}$  as the value that Google Trends gives.

This is  $X_{j,s} = x_{j,s} / x_{max,s}$  where  $x_{j,s}$  is the fraction of Google searches in area  $j$  in sample  $s$  that are in  $X$  (see Eq. (1)).

Take two words  $N$  and  $W$ . And let  $C = N \cup W$  and  $B = N \cap W$ . Then  $n_{j,s} = c_{j,s} - w_{j,s} + b_{j,s}$ . Denoting  $x_j$  as the expected value of  $x$  in area  $j$ , then  $n_j = c_j - w_j + b_j$ . Assume that we have an area for which, for  $x \in \{c, w, n, b\}$ ,  $x_{j,s}$  is independent of  $X_{max,s}$ . Then  $X_j = x_j / x_{max}$ . Then

$$N_j = \frac{c_{max}}{n_{max}} C_j - \frac{w_{max}}{n_{max}} W_j + \frac{b_{max}}{n_{max}} B_j. \quad (5)$$

Assume that  $B_j$  is negligible, a reasonable assumption for words used in this paper. The issue is that  $N_j$ , the word of interest, is only reported for about 30 media markets, whereas  $C_j$  and  $W_j$  are reported for about 200 media markets. Since  $N_j$  depends linearly on  $W_j$  and  $C_j$  I can find  $\frac{C_{max}}{n_{max}}$  and  $\frac{W_{max}}{n_{max}}$  using data for any media market that reports all 3 values. I can then use these numbers to find  $N_j$  for all 200 that report  $W_j$  and  $C_j$ . If  $C_j$ ,  $W_j$ , and  $N_j$  were reported with no error for media markets, I could find exact numbers. Even with 5000 downloads, I do not get perfect estimates of  $C_j$ ,  $W_j$ , and  $N_j$ . I thus back out the coefficients by regressing the averages for 30 media markets that have all data available. The  $R^2$  on this regression is 0.86, meaning there is minor remaining error. After 5000 downloads, regressing halves of the samples suggest that this strategy has captured about 80% of the variation in the actual number. To deal with the minor remaining error, I use the first half sample estimate as an instrument for the second half sample when racially charged search is an independent variable in regressions.

Algorithm in practice:

1. Download 5000 samples for “weather,” from 2004 to 2007.
2. Download 5000 samples for “nigger + niggers,” from 2004 to 2007. (A “+” signifies an “or.”)
3. Download 5000 samples for “nigger + niggers + weather,” from 2004 to 2007.

4. Eliminate any media market that ever scores 0 or 100 for “weather.” (A 0 means absolute search volume is too small. A 100 means it scores the maximum.) (12 of the smallest media markets in the country are eliminated, 10 that never show up and 2 that compete for the top “weather” search spot.)
5. Calculate a media market's average score for “weather,” “nigger + niggers,” and “nigger + niggers + weather.”
6. Regress “nigger + niggers” average score on “weather” average score and “weather + nigger + niggers” average score for the markets that never score a 0 or 100 on “nigger + niggers.”
7. Use coefficients from regression to back out “nigger + niggers” for remaining markets, using their average search volume for “weather” and “nigger + niggers + weather.”

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