

UC San Diego

UC San Diego Electronic Theses and Dissertations

Title

Political competition, emotions, and voting : the moderating role of individual differences

Permalink

<https://escholarship.org/uc/item/68p78479>

Author

Settle, Jaime Elizabeth

Publication Date

2012

Peer reviewed|Thesis/dissertation

UNIVERSITY OF CALIFORNIA, SAN DIEGO

**Political Competition, Emotions, and Voting: The Moderating Role of
Individual Differences**

A dissertation submitted in partial satisfaction of the
requirements for the degree
Doctor of Philosophy

in

Political Science

by

Jaime Elizabeth Settle

Committee in charge:

Professor James Fowler, Chair
Professor Trey Ideker
Professor Gary Jacobson
Professor Martin Johnson
Professor Darren Schreiber

2012

Copyright
Jaime Elizabeth Settle, 2012
All rights reserved.

The dissertation of Jaime Elizabeth Settle is approved,
and it is acceptable in quality and form for publication
on microfilm and electronically:

Chair

University of California, San Diego

2012

DEDICATION

To all the people in my life who remind me why I was inspired
to embark on this journey in the first place.

TABLE OF CONTENTS

Signature Page	iii
Dedication	iv
Table of Contents	v
List of Figures	vi
List of Tables	vii
Acknowledgements	ix
Vita and Publications	xiii
Abstract of the Dissertation	xiv
Introduction	1
Chapter 1 A Role for Negative Affectivity in the Relationships between Competition, Emotion, and Voting	6
Chapter 2 The Effects of Electoral Competition on Emotional Response	32
Chapter 3 Day-to-Day Political Engagement Partially Mediates the Effect of Competition on Voting	51
Chapter 4 Political Contention and Stress Sensitivity Interact to Affect Voter Turnout	103
Chapter 5 Negative Affectivity, Political Contention and Turnout: A Genopolitics Field Experiment	138
Conclusion	170

LIST OF FIGURES

Figure 1.1: Schematic of unified theory	22
Figure 1.2: Schematic of predictions derived from theory	23
Figure 2.1: Predicted probability of emotional response	40
Figure 2.2: Emotional expression for presidential candidates	48
Figure 3.1: Schematic of mediation model	57
Figure 3.2: Growth of status messaging on Facebook in 2008	65
Figure 3.3: Emotionality of status message posting over time	68
Figure 3.4: Direct effect of battleground on voting	71
Figure 3.5: Battleground effect on status message posting	74
Figure 3.6: The relationship between status message posting and voting	77
Figure 3.7: The effect of message posting on voting	78
Figure 3.8: Summary of results in the mediation framework	80
Figure 3.9: Distribution of Facebook status messages, by type	93
Figure 3.10: Political discussion, by day	94
Figure 3.11: Positive emotional status message posting	100
Figure 3.12: Angry status message posting	101
Figure 3.13: Anxious status message posting	102
Figure 4.1: Predicted probability of voting	132
Figure 4.2: Precinct characteristics	136
Figure 4.3: Precinct heterogeneity in midtown San Diego	137
Figure 5.1: Treatment Mailer	147
Figure 5.2: Comparison of treatment to other stimuli	150
Figure 5.3: Treatment effects differ by genetic risk	154

LIST OF TABLES

Table 2.1:	Effect of state-level competition on reported emotion toward the candidates of the respondent's own party and the opposition party	39
Table 2.2:	Effect of district-level competition on reported emotion toward the candidates of the respondent's own party and the opposition party, looking only at respondents living in "black-out" states.	43
Table 2.3:	The proportion of partisans who report emotional activation to the candidates	46
Table 2.4:	Replication results for main finding	49
Table 2.5:	Robustness check of main result	50
Table 3.1:	Balance testing in matched sample	66
Table 3.2:	Proportions of emotional status messages	67
Table 3.3:	Descriptive statistics of mediator and dependent variables	69
Table 3.4:	Battleground effect on status message posting	73
Table 3.5:	Characteristics of the unmatched sample	85
Table 3.6:	Means of key covariates in the states selected for study	86
Table 3.7:	Key characteristics related to voter registration and turnout in the states selected for study.	87
Table 3.8:	Information about the 2008 primary and caucus results in states selected for study.	88
Table 3.9:	Characteristics of the electoral campaign in the states selected for study.	89
Table 3.10:	Politically predictive words in the political coding dictionary	91
Table 3.11:	Examples of processed Twitter messages	92
Table 3.12:	Emotionality of words in the political coding dictionary	95
Table 3.13:	Non-political overlap in the dictionaries	96
Table 3.14:	Political overlap in the dictionaries	97
Table 3.15:	Selected words from the political coding dictionary	98
Table 4.1:	Summary statistics for California sample	113
Table 4.2:	Regression results from California sample	115
Table 4.3:	Summary statistics for original Add Health sample	124
Table 4.4:	Summary statistics for replication Add Health sample	125
Table 4.5:	Summary statistics for complete cases in the combined Add Health sample	126
Table 4.6:	Regression results from original sample	129
Table 4.7:	Regression results from replication sample	130
Table 4.8:	Regression results from combined sample	131

Table 5.1:	Balance tests for treatment and control groups	145
Table 5.2:	Direct effect of genetic risk	152
Table 5.3:	Interaction of genetic risk and treatment	153
Table 5.4:	Negative affectivity SNPS 1	160
Table 5.4:	Negative affectivity SNPS 2	161
Table 5.4:	Negative affectivity SNPS 3	162
Table 5.5:	SNPS in negative affectivity risk index	163

ACKNOWLEDGEMENTS

Conventional wisdom warns that completing a dissertation can be a very isolating experience, but I have found the exact opposite to be true. I am immensely appreciative for the intellectual and emotional support I have received from my family, friends, colleagues, and mentors.

I am especially grateful to my parents. My father, Gene Settle, inspires me with his boundless curiosity about how the world works. He taught me through example how to be an interdisciplinary learner, and I admire the way that he pushes himself and his students to tackle tough problems through creative, but methodical, thinking. He also has a knack for knowing just what to say when I'm grappling with something difficult, and I appreciate the advice and encouragement he gave me at each major step along the way. I look forward to consulting with him as I encounter the new challenges associated with being a professor. I could not be more proud of my mother, Patty Settle, for the way that she models perseverance and resilience toward life's "curve balls." Endeavoring to complete such a large undertaking as a doctoral degree was much less daunting because, from the time I was a young child, she instilled in me the importance of goal-directedness, organization, and persistence. These skills are no less critical to completing a Ph.D. than are the analytical and communication skills more commonly associated with the task. My mom never fails to be enthusiastic about my successes, no matter how small, and I thank her for always being so inquisitive and excited about the details of my life.

My 95-year-old grandfather, Morton Jacobs, continues to be a pivotal influence on my life. He often tells me that he is proud of what I've accomplished, but that he loves me for who I am as a person. The reminder that I am more than my work has meant much to me over the years. I cherish the stories and memories of my grandparents who are no longer with us—my grandmothers, Marjorie Jacobs and Florence Settle, and paternal grandfather, J.C. Settle. *L'dor v'dor*.

I've been surrounded by friends, near and far, who have been respectful of the amount of time I've poured into my work while helping me remember

that my priorities lie firmly in my relationships with other people, not in my relationship with my data. My group of girlfriends in San Diego helped me keep one foot in reality, so to speak. Wednesday nights with Lydia Lundgren, Julia Schneider, Kate VanEmrik, Danielle Jung, and Laura Pina Rosenweig have kept me sane the past few years. Rupal Mehta and Meghan Edwards always let me vent, judgment free. Friends from earlier stages of my life had some distance on the process of graduate school and have watched me evolve from a naive and idealistic college student, dreaming of becoming a professor, to a less-naive but still idealistic graduate student excited to start her first job. Thanks especially to Dave Raiser, Godfrey Plata, Austin Scharf, Nicole Conner, John Rosato, Lisa Crabtree, Ashley Crenshaw, Beth Prosnitz and Jenna Gibson Skinner for believing in me and promising to buy cases of my first book.

While James Fowler gets much-deserved recognition for his scholarly research, I believe he does not get sufficient recognition for the quality of his advising, mentorship, and commitment to fostering formal and informal interactions among his colleagues. James had confidence in my research skills before I did, and his financial support and mentorship facilitated my belief that I have what it takes to be a social scientist. James makes research fun, and although I don't know the source of his constant energy, we all benefit because of it. The other members of my committee also deserve my warmest thanks. Darren Schreiber was always available to "walk and talk" through ideas. Martin Johnson encouraged me to situate my work broadly and to consider the implications of the research agenda I've pursued. Gary Jacobson was the voice of Occam's Razor and reminded me that straightforward analysis, logical thinking and clear communication are as important when dealing with millions of data points as when dealing with dozens. Trey Ideker reliably asked me questions that forced me to articulate my ideas credibly and accurately.

I am grateful to the members of the Human Nature Group for holding me accountable for thinking big and doing good work. It has been an extremely meaningful experience to be part of such a supportive and high quality research group. Coauthorship preceded close friendship in several cases, and I

thank Robert Bond, Chris Dawes, Chris Fariss, Jason Jones, and Peter Loewen first and foremost for being so much fun, followed closely for being such good colleagues. I also thank Brad LeVeck, Alex Hughes, and Mike Rivera for their feedback and friendship.

Several other people in the UCSD Political Science Department deserve special recognition. Marisa Abrajano was a sounding board, a mentor, a friend, and even a landlord. My multifaceted relationship with her has given me so much confidence and comfort over the past five years. Devesh Tiwari, Dan Smith, Vlad Kogan, and Hans Hassell played integral parts in my professional development. Sarah Knoesen, Cesi Cruz, Leigh Bradberry, and Jen Piscopo were excellent mentors. The other members of my entering cohort challenged me and pushed me to succeed. They set the bar high.

This dissertation was supported by several grants, and I am grateful for the opportunities this support afforded me. James Fowler's National Science Foundation grant "The Genetic Basis of Civic Engagement and Social Networks" (NSF SES-0719404) supported much of the early conceptual work and methods training involved in the dissertation. He was the principal investigator on two grants we co-wrote which secured funding to do the contextual data matching in Chapter 4 ("Gene-Environment Interactions with the Political Context," NSF #0843907, and "Genopolitics and Political Context," UC San Diego Committee on Research). The National Science Foundation awarded me a dissertation improvement grant ("Political Competition, Anxiety, and Voting — The Moderating Role of Individual Differences," #2011-2247). The Worth and Dot Howard Foundation provided financial support every year of college and graduate school, and my education has been enriched significantly because of this funding. I thank Murray Stein and Dan O'Connor for their interest in genopolitics and their willingness to share data and access to the participants in their research studies.

Three of the chapters in my dissertation have been prepared, or submitted, for publication. Although I was responsible for the research design, analysis, and writing of the material in Chapter 3, the research could not have

been completed without valuable contributions in data extraction and coding from Robert Bond, Lorenzo Coviello, James Fowler, Jason Jones, Adam Kramer, and Cameron Marlow. Chris Dawes and Peter Loewen were coauthors on the work in Chapters 4 and 5, and contributed at several stages to the project. Costas Panagopoulos aided in the preparation of the manuscript for Chapter 5.

VITA

2007	B. A. in Political Science <i>summa cum laude</i> , University of Richmond
2009	M. A. in Political Science <i>with distinction</i> , University of California, San Diego
2012	Ph. D. in Political Science, University of California, San Diego

PUBLICATIONS

"Games, Genes, and Political Participation" (with Christopher T. Dawes, James H. Fowler, and Peter John Loewen), in *Man is by Nature a Political Animal*, eds. Rose McDermott and Peter Hatemi (September 2011).

"Integrating Social Science and Genetics: News from the Political Front" (with Christopher Dawes, Peter Hatemi, Amanda Frost Keller, Brad Verhulst), *Biodemography and Social Biology*, 57(1): 67-87, (May 2011).

"The Social Origins of Adult Political Behavior" (with Robert Bond and Justin Levitt), *American Politics Research*, 39(2): 239-263, (March 2011).

"Correlated Genotypes in Friendship Networks" (with Nicholas Christakis and James Fowler), *Proceedings of the National Academy of Sciences*, 108(5): 1993-1997, (1 February 2011).

"Friendships Moderate an Association between a Dopamine Gene Variant and Political Ideology" (with Nicholas Christakis, Christopher Dawes, and James Fowler), *Journal of Politics*, 72(4): 1189-1198, (October 2010).

"The Heritability of Partisan Attachment" (with Christopher Dawes and James Fowler), *Political Research Quarterly*, 62(3): 601-613, (September 2009).

ABSTRACT OF THE DISSERTATION

**Political Competition, Emotions, and Voting: The Moderating Role of
Individual Differences**

by

Jaime Elizabeth Settle

Doctor of Philosophy in Political Science

University of California, San Diego, 2012

Professor James Fowler, Chair

Why does the competitiveness of an election affect voter turnout? Previous research has focused on elite behavior in mobilizing political participation and voters' altered assessments about the importance of their vote. However, I argue that exposure to political competition activates voters' emotions—which in turn affect the decision to turnout—and that individual differences in threat sensitivity moderate this mediated relationship. After first elaborating a theory for these relationships, I use data from the 2008 National Election Study to demonstrate that heightened electoral competitiveness is associated with stronger emotional evaluations of the presidential candidates. To further elucidate the relationships, I collect a sample of 113 million status messages posted

on the online social networking site Facebook during the 2008 presidential election. Automated content analysis reveals that users living in competitive "battleground" states are more likely to express emotion when they discuss politics on the site, and that emotional activation in status messages partially mediates the relationship between exposure to competition and self-reported voting. I next explore whether a genetic sensitivity to threat conditions the way that exposure to political contention affects voter turnout. The nascent genopolitics literature theorizes that genetic, psychological, and physiological differences should be integral in interpreting political stimuli from the environment, but there have been few empirical confirmations of this expectation. I find in two distinct datasets that people who carry a version of a gene that makes them especially sensitive to social stress are more responsive to the level of contention in their political environment. I follow up on this finding with a mobilization field experiment designed to activate emotions toward political competition. My dissertation is one of the first attempts to identify the specific causal mechanisms that underlie the effects of individual biological differences on political outcomes. This research topic is relevant and timely: as our country continues to polarize and the consequences of people's emotional reactions to political disagreement intensify, it is important to understand the causal mechanisms that relate political contention to political behavior.

Introduction

Competitive elections are lauded as an essential component of a healthy democracy, in part because of the effects competition is thought to have on citizen interest, knowledge, and engagement. A citizenry that is motivated to participate because of the uncertainty and perceived importance of the outcome of the election is more likely to hold accountable the officials who seek to represent them.

Yet, the media's portrayal of competitive elections is one in which citizens become more emotional about politics without necessarily becoming more interested or informed. Anecdotes abound that suggest that emotions run high in the political sphere (Valentino et al., 2011). Newspaper headlines declare that voters' emotions prompt their political engagement (or disengagement) as well as their vote choice. President Obama offered many people hope in 2008, yet by 2010 the media noted a huge "enthusiasm gap" between Republicans and Democrats. Electoral swings are often described as reactionary "waves of anger" and people express great anxiety and contempt in surveys about the direction the country is heading.

Instead of embracing contention as a necessary and beneficial aspect of the democratic process, many people report aversion to the degree of discord in our society. People report being "fed up" with partisan politics and frustrated by the disagreement, gridlock and subsequent inefficiency of Congress. Interviews and focus groups reveal that people overestimate the degree to which there is consensus about policy preferences, and therefore are turned off from politics by what they perceive as unnecessary and destructive interest group lobbying and partisan discord (Hibbing and Theiss-Morse, 2002). Some pun-

dits even blame tragedies like the assassination attempt on Congresswoman Gabrielle Giffords on an uncivil, contentious and polarized political environment.

This dissertation explores the role of emotion in mediating the effect of political competition on the ultimate measure of participation: the decision to turn out and vote. I argue that increased political competition—over resources, values, or election outcomes—increases emotional activation toward political stimuli. When politics is most contentious, it has the potential to activate both positive and negative emotional responses toward relevant and salient aspects of the political environment. However, the exact pattern of relationships between competition, emotional activation and voter turnout depends on an individual's sensitivity to threat and the degree to which they perceive their political environment to be stressful.

In the first chapter, I develop a theory which suggests that emotional activation with the political sphere *mediates* the effect of exposure to political competition on voter turnout. On average, people are more emotionally engaged with politics when they live in communities which experience higher levels of political competition. The heightened salience of politics and increased exposure to political contention in these areas makes it more difficult to avoid politics completely, even for those people who remain cognitively disengaged with politics. This emotional engagement with politics in turn affects a person's propensity to participate in politics, but the exact nature of this mediated relationship is subject to the *moderating* effects of individual differences in a construct called negative affectivity, which alters a person's sensitivity to, and perception of, the degree to which their political environment is socially stressful and threatening. Individuals who are not prone toward negative affectivity are more likely to respond positively to increased political competition, and their heightened emotional activation with politics motivates their political participation. However, for individuals I call "negative affectives," the heightened emotional activation they experience after exposure to increased political contention serves to reduce their incentives for political participation.

The first two empirical chapters of the dissertation explore the general relationships between competition, emotional activation, and voter turnout. In Chapter 2, I use data from the 2008 National Election Study to test the theory that competition affects people's emotional evaluations of the presidential candidates. Consistent with previous work that demonstrates that patterns of emotional response to campaign advertisements are different for Republicans and Democrats, I find that state-level electoral competition polarizes Republicans' emotional evaluations while tempering those of Democrats.

However, a major disadvantage of the national survey data is that the empirical measures of emotional response do not capture the full theoretical constructs outlined in Chapter 1. Emotional engagement has typically been ascertained by asking survey respondents to report whether or not certain candidates or political issues make them "enthusiastic" or "anxious." However, emotional engagement with politics is likely interspersed within a person's daily engagement or disengagement with politics and previous studies of the role of emotion in politics have been unable to capture unobtrusive observational data about emotional engagement. While experimental data have been able to better identify the causal relationship between various stimuli and emotions, it is possible that experimental elicitations of emotion may be subject to the Hawthorne effect.

Thus, in Chapter 3, I collect a unique dataset derived from the status messages posted by almost two million Facebook users in the United States during the 2008 election. This data allows us to study for the first time the spatial and temporal distribution of reports of emotion to politics and political campaigns. One of the major contributions of the dissertation is the generation of a dataset suitable for exploring how people's daily engagement with politics affects their political participation. I find a role for both emotional and cognitive engagement with politics in mediating the relationship between living in a competitive "battleground" state and self-reported voter turnout.

My theory argues that to fully understand the relationship between competition and voting, we must understand how individual differences alter

the role that emotional activation plays in mediating the competition-voting relationship. The second half of the dissertation seeks to extend beyond the average relationships found in the first two empirical chapters to describe the role of "negative affectivity" in moderating the relationship between competition, emotional activation, and voting. In Chapter 4, I examine the effects of one particular genetic marker in moderating the effects of political contention on voter turnout. The short allele of the serotonin transporter gene 5HTT has been shown in previous studies to be less transcriptionally efficient, perhaps causing those who carry it to be less resilient to stressors in their environment. My results demonstrate that those who carry the short allele of 5HTT are less likely to vote, but only when confronted with a contentious political environment as measured either by living in a precinct where the two major political parties have approximately equal numbers of registered supporters, or living in a county where the respondent's political beliefs are out of step with the majority.

The results in the fourth chapter are based on observational data, and may be sensitive to endogeneity, in the sense that people select into their residential environments for reasons that may be correlated with the partisan composition of their community, preventing us from isolating the effects of contention itself from the choice to be exposed to it. Thus, in the final chapter, I conduct a field experiment in the 2010 Congressional elections on a genetically informative sample of Californians. Half of the sample was mailed a postcard designed to make salient the degree of competition and uncertainty in the electoral environment. Those users who are genetically predisposed toward negative affectivity were less likely to turnout and vote, but only when they received the treatment postcard.

The research presented in this dissertation advances our understanding of *how* competition influences voter turnout by examining *heterogeneity* in the relationships between competition, emotional activation, and voting. Political scientists have traditionally been methodological pluralists, comfortable borrowing the tools and practices of other disciplines and extending them to

apply to our own puzzles. Using a variety of methodological tools and data sources allows me to approach this problem from many angles to best understand the nuances of the relationships of interest. A full test of all the moving parts in the model remains to be addressed in subsequent research. However, the relationships and patterns revealed in the following chapters offer a compelling—albeit circumstantial—case that the way people respond emotionally to politics is a function of both their individual predispositions and the characteristics of the environment in which they live. The recent developments in behavioral genetics, neurophysiology, and psychology have the potential to transform the way we conceptualize the role of emotions in voting. This work represents one of the first attempts to identify the specific causal mechanisms that underlie the effects of individual biological and psychological differences on political outcomes. The more we learn about how innate, individual differences affect our interpretations of the exogenous environments we encounter, the more we can contribute to the discipline at large about which environments matter, and more importantly, why.

Chapter 1

A Role for Negative Affectivity in the Relationships between Competition, Emotion, and Voting

Introduction

The political world is ripe with stimuli to trigger emotional responses, yet political scientists know much more about the *consequences* of emotional activation than we do about its *origins*. Emotional activation has been identified as an important contributor to the way that we think and behave in the political sphere, but it has not yet been conceptualized as a mediating factor that links broader contextual exposures to individual political behavior.

In this chapter, I develop a theory that suggests that emotional activation with the political sphere *mediates* the effect of exposure to political competition on voter turnout. On average, people are more emotionally engaged with politics when they live in communities that experience higher levels of political competition. The heightened salience of politics and increased exposure to political contention in these areas makes it more difficult to avoid politics completely, even for those people who remain cognitively disengaged with politics.

This emotional engagement with politics in turn affects a person's propen-

sity to participate in politics, but the exact nature of this mediated relationship is subject to the *moderating* effects of individual differences in a construct called negative affectivity, which alters a person's sensitivity to, and perception of, the degree to which their political environment is socially stressful and threatening. Individuals who are not prone toward negative affectivity are more likely to respond positively to increased political competition, and their heightened emotional activation with politics motivates their political participation. However, for individuals susceptible to negative affectivity, the heightened emotional activation they experience after exposure to increased political contention serves to reduce their incentives for political participation.

These contradicting emotional responses—and the divergent predictions about the effect of emotional response on participation—obscure the true effect of competition on voting. Average estimates of the unmoderated relationship between competition and voter turnout that do not accurately account for the heterogeneous effects of competition on emotional response, and emotional response on voting, may inadvertently misconstrue the nature of the competition-voting relationship. Competition, emotional response, and voting are related to each other in different ways for different people. After elaborating on these proposed relationships, I articulate testable hypotheses that result from the theory, and describe the operationalization of my constructs in the empirical chapters in my dissertation.

Competition and Voting

One of the most studied puzzles in political science is whether voter turnout is higher in more competitive elections. The early work studying the effects of political competition was primarily concerned with understanding whether increased political competition in a geographic context—usually a state (Patterson and Caldeira, 1983), county (Hoffstetter, 1973) or congressional district (Silberman and Durden, 1975)—affects voter turnout. Many studies show small but significantly positive effects of competition on turnout, whether

competition is operationalized using presidential election results from preceding elections (Ashenfelter and Kelley, 1975), using the closeness between parties in contemporaneous elections (Patterson and Caldeira, 1984), or incorporating information about voter registration (Grofman, Collet and Griffin, 1998) or candidate expenditures during the race (Cox and Munger, 1989). Scholars have provided three main explanations for the effect: 1) voters are more likely to think their vote matters when an election is perceived as being close; 2) political elites and political parties concentrate their mobilization efforts on competitive races and 3) more money is spent on campaigns in competitive races, which may indirectly increase voters' interest or knowledge levels.

In line with the approach focusing on candidate expenditures (Cox and Munger, 1989), later literature has shifted focus to the mechanisms of the effect of competition, often focusing on various "campaign effects." One major approach focuses on campaign effects measured by expenditures on television ads (Freedman and Goldstein, 1999; Goldstein and Ridout, 2002; Hillygus, 2005; Freedman, Franz and Goldstein, 2004), as more advertising is typically bought in areas that are expected to be more competitive (Shaw, 1999, 2006; Hill and McKee, 2005). These studies find that increased exposure to political advertisement is predictive of higher levels of voter turnout. Field experiments demonstrate that direct canvassing can increase validated turnout (Gerber and Green, 1999, 2000*a,b*; Green, Gerber and Nickerson, 2003) but much of this work has been done in low salience elections that do not simulate competitive campaign environments. Other approaches to measuring the effect of competitive or intensive campaigns include counting the number of field offices in a state (Masket, 2009) or the frequency of candidate visits (Franz and Ridout, 2010; Shaw, 1999); this work, however, focuses on the effects on candidate vote share as opposed to overall turnout.

At the core of these measurement strategies is the idea that residents in competitive areas have qualitatively different exposure to the campaign than residents of non-competitive areas. At the presidential election level, the nature of the Electoral College system mandates that in every election, certain states

will become critical and voters living in these "battleground states" receive disproportionate attention from the campaigns (Shaw, 2006). Because of the theoretical distinction between experiencing a campaign in a state that is highly competitive versus a state where the outcome is essentially pre-determined, as well as the practical consideration of the multi-collinearity introduced when different but highly correlated measures of political competitiveness are incorporated into the same model, it has become common practice to measure competitiveness at the state level with a dummy variable for a state's "battleground status" in that election year. Previous work shows that campaign effects are stronger in battleground states, and that battleground states are subject to more television and radio campaign advertising and more candidate visits (Shaw, 1999, 2006; Hill and McKee, 2005). The campaigns make more contact with voters in battleground states, and more attention is paid to battleground voters in the form of polling and news stories (Shaw, 2006).

Contextual scholars theorize about competition's effects on turnout at the individual level, but due to data constraints this relationship has often been explored at the aggregate level and thus inference from this data has been sensitive to the threats of ecological fallacy. Very rarely is contextual data matched with survey data that captures voter awareness of, or sensitivity to, the electoral context created by political competition (for an exception, see Huckfeldt et al. (2007)). Other studies have focused on the campaigns' interaction with voters, using survey data to capture the effect of mobilization on voter interest, knowledge and self-reported turnout (Rosenstone and Hansen, 1993; Verba, Schlozman and Brady, 1995; Huckfeldt et al., 2007). It appears that people become more interested, engaged, and attentive to the political campaign in the battleground states (Gimpel, Kaufmann and Pearson-Merkowitz, 2007; Hill and McKee, 2005; Panagopoulos, 2009). Lipsitz (2009) shows that participation gaps—in voting, meeting attendance, donating, and discussion—between states in the battleground and "spectator" (or blackout) states are largest in presidential elections that are nationally competitive, and that the gaps that do exist are created because residents in competitive states become more engaged,

not because residents in safe states withdraw from political engagement.

This recent work updates our understanding of which aspects of the environment might matter, but little work has been done to study whether an individual's psychological response to competition might also matter. Another strain of literature, however, suggests that emotion may be a key element shaping voter response to competition, and laboratory experiments have demonstrated that voters may be emotionally responsive to the kinds of exposures they encounter in a competitive environment.

The Role of Emotion

Explorations of the role of emotion in shaping attitudes and beliefs has a long tradition in Western thinking (Marcus, Neuman and Mackuen, 2000). The early work on emotion in politics focused on feelings about candidates or issues as distinct contributions from the cognitive considerations involved in preference formation (Abelson et al., 1982; Conover and Feldman, 1986; Kinder, 1994) while in more recent years an effort has been made to conceptualize *how* emotion affects political thinking and behavior. The modern incarnation of the emotion in politics literature seeks to understand how the processes governing our emotions—such as their functions in environmental feedback (Frijda, 1986), regulation, and behavioral direction (Damasio, 1999)—affect the way we respond to political stimuli and how these response alter our political behavior.

Previous Literature on Emotion in Politics

What has become the standard conceptualization of the role of emotion in political behavior, the theory of Affective Intelligence, or "AIT" (Marcus, Neuman and Mackuen, 2000), suggests a dual processing model in which two different emotional subsystems regulate the response to cues in the political environment: the disposition system affects levels of enthusiasm and aversion when processing routine information, and the surveillance system affects lev-

els of anxiety in response to novelty or threat. Most of the time, under routine circumstances, people rely on their predispositions to guide their political attitudes and behavior. However, when the surveillance system identifies novelty or threat in the environment, people are motivated to learn, pay attention to political affairs, and carefully consider alternative outcomes when making decisions. The research design initially employed by these scholars used surveys to ascertain respondent self-awareness of their emotions toward specific political candidates (Marcus, Neuman and Mackuen, 2000) and then examined the relationships between those emotional states and candidate assessment, partisanship, political participation, and vote choice.

The theory of AIT has not been accepted unconditionally. In addition to broader debates originating in psychology about the dimensions and specificity of affective response, the main debate in political science has been over the consequences of emotional activation for the quality of information processing. Affective Intelligence Theory argues that people make better decisions when they become anxious because of the heightened attention they direct towards the political environment. Conversely, Lodge and Taber (2005) argue for a theory of Motivated Reasoning, suggesting that "hot cognition," the combination of cognition and emotion, results in suboptimal, biased information processing.

Furthermore, there has been considerably less theorizing about the triggers for emotion in the political environment. Thus, more than ten years after AIT was first published, we do not yet have a comprehensive understanding of the sources of emotional activation (Wolak and Marcus, 2007). The literature thus far suggests a somewhat circumscribed set of targets for emotional response. In order to replicate, expand upon, and attempt to falsify the hypotheses of Affective Intelligence Theory, scholars have tended to ask survey questions about the same sets of triggers and targets, limiting our understanding of the full expanse of the role of emotion in politics. Two problems related to measurement also complicate the effort to expand the stimuli that provoke emotion. First, it is difficult to acquire data to test for possible relationships

between aspects of the broader political environment and emotional response. National survey data typically contains insufficient variation in variables measuring contextual effects to draw conclusions about the effects of the environment on individual-level behavior (Schaffner, 2011), and overcoming this problem can require a dedicated effort to collect survey data appropriate for answering these questions (Huckfeldt et al., 2007). Second, our understanding of emotional response suggests that it is best measured at the time it is experienced, rendering it more appropriate for study in the laboratory. However, this limits our understanding of the accumulation and longer-term effects of repeated emotional activation during the course of a campaign.

As a result of these problems, political candidates remain the most well-studied trigger and target for emotional response. Many analyses still employ the standard candidate emotion battery asked in the National Election Study. An important strain of work moves instead into the laboratory to examine how information about candidates alters affective evaluations (Civettini and Redlawsk, 2009; Redlawsk, 2007). Other work has focused on the effects of emotional response to political issues (Huddy et al., 2005; Huddy, Feldman and Weber, 2007) and policy threats (Brader, Valentino and Suhay, 2008; Miller and Krosnick, 2004). Important ground has been covered by examining emotional response to advertisement tone (Brader, 2005, 2006) in experimental settings. Building off the findings from the experimental framework, recent studies have examined campaign advertisements in a real-world campaign to characterize when in the course of the campaign candidates employ emotional appeals (Ridout and Searles, 2011) or whether the tone or emotional appeal of a campaign ad affects political participation (Brader and Corrigan, 2007).

Only one study to date has considered the effects of a broad contextual influence on vote choice, but while the authors suggest that their findings are consistent with the assumptions of Affective Intelligence Theory, there is no measurement of affective response in the study. Nardulli and Kuklinski (2007) demonstrate that worsening local conditions in employment and crime, and worsening national conditions of peace, affect changes in the incumbent

party's normal vote share in ways consistent with the predictions of AI Theory. However, they use longitudinal data aggregated at the county level and cannot show that the change in vote share is due to affective calculations on the part of the voters. In fact, they note that their findings are consistent with several theories of voter decision-making.

While researchers have expanded on the initial AIT framework to consider the role of emotion directed at targets other than the presidential candidates, we don't yet have solid theory for how the political environment triggers emotional response. The specific contribution of emotional activation as a mediating individual-level factor linking political competition and voter turnout has been underdeveloped. In the next section, I articulate why a wider range of stimuli in the political environment—specifically those related to political competition—could provoke an emotional response which has implications for voter behavior.

The Context as a Stimulus for Emotion

As David Campbell notes, "equating politics with conflict underpins much of the political science literature and is an assumption shared by scholars working within many theoretical frameworks" (Campbell, 2006, p. 1). Electoral politics highlight the underlying political conflict in society, making contention more salient and visible and serving to reinforce to citizens the pervasiveness of disagreement in the political system. Whether this contention is experienced as exposure to heightened campaign intensity, public incivility, or heated discussion with one's neighbors or friends, it affects our attitudes toward politics and government (Mutz and Reeves, 2005; Gimpel, Lay and Schuknecht, 2003) as well as our decision to engage in political discussion and the electoral process (Mutz, 2002; Campbell, 2006; Huckfeldt, 1986; Huckfeldt, Johnson and Sprague, 2002, 2004; Pattie and Johnston, 2009).

Politics—as the process through which people attempt to manage the conflicts between competing interests, values, and priorities—becomes most contentious in the context of a competitive election. Residents of areas with

competitive elections have qualitatively different exposure to politics than do residents of non-competitive areas. The variation in the competitiveness of presidential elections creates variation in exposure to information and the experience of politics (Jackman and Vavreck, 2009; Huckfeldt, 1986). Similar to the "battleground" experience previously described, similar comparisons could be made for citizens exposed to electoral competition in other types of races, such as competitive gubernatorial or congressional battles. Simply put, people exposed to electoral competition are exposed to more of the contentious clash of interests defining the nature of politics itself.

Perhaps more important for examining the enduring effects of exposure to political competition is the way that competition can alter the social landscape associated with politics. Living in an area with high levels of political competition increases the probability of exposure to political contention and disagreement; this contention in a person's surroundings affects the social experience of politics, such as the way people interact with others about political issues at the office, with their friends, or in their neighborhood. Despite the admonition that polite conversation should never address religion or politics, we know that these two belief systems have a strong influence on the way that we structure our social environments. Research suggests that we often associate with those who are most similar to us. However, the construction of a person's social network is contingent in part on the characteristics of the broader social context (Huckfeldt, Johnson and Sprague, 2004), and the heterogeneity of one's geographic area is correlated with the diversity of opinion in one's reported discussion network (Pattie and Johnston, 2000; Campbell, 2006). Thus, in environments where politics is more competitive, it is difficult to be completely isolated from competing political viewpoints and people living in more competitive areas are more likely to talk about politics with people with whom they disagree, despite the influences of homophily (Huckfeldt, Johnson and Sprague, 2004). Neighborhood or workplace political composition could influence the types of informal interactions encountered in the immediate environment, whether through active interactions such as political discussion,

or through more passive observations such as the presence of yard signs or bumper stickers (Huckfeldt, 1986, p. 10) (Books and Prysby, 1991, p. 54-57). Political disagreement can manifest even in the absence of a national election; it is not difficult to discern a neighbor's or coworker's political leanings from short interactions about seemingly unrelated topics.

Contention could affect people's emotional engagement with politics because it is inescapable, thus affecting people who may not report being particularly interested in politics generally or the campaign specifically. Even if people do not pay much attention to the important issues at stake in an election, they may still be aware of the presence of political competition through an increased number of television advertisements, radio spots, campaign signs, news stories, or water-cooler conversations in their environment, for example. They are more likely to be mobilized and have personal contact with a campaign in competitive elections (Huckfeldt et al., 2007). Politics is not solely about thinking, but is also about feeling. Thus, regardless of whether people pay attention to the content of the exchange of political information in their environment, they are likely to recognize the presence of competitive elections and respond emotionally. Emotion is thought to precede political evaluation and judgment, and consequently people may have an emotional reaction to politics even if it does not affect downstream political processing.

A large literature in psychology stemming from early seminal work demonstrates the difficulty people have in reconciling conflict (Festinger, 1957; Fromm, 1965). We know that the perception of threat can trigger both anger and anxiety, and both visual cues and social interactions are known triggers of emotional response (Clark and Watson, 1988; Hariri, 2009). Less attention has been paid to these effects in the political sphere, but previous work from diverse areas of political science suggest that engaging politically in conflicted situations can be uncomfortable and disagreeable (Mansbridge, 1980; Noelle-Neuman, 1993; Hibbing and Theiss-Morse, 2002). Consistent with this work is the finding that disagreement can depress turnout among the conflict avoidant (Mutz, 2002), and the activation of negative emotions may be one potential

mechanism for this effect. We know that people who are strong partisans are more emotionally reactive to certain kinds of stimuli (Huddy and Mason, 2008), and competition may activate increased partisan intensity. People in competitive areas talk about politics more frequently (Lipsitz, 2009) and cross-cutting political discussion affects both positive and negative emotional reactions to candidates (Parsons, 2009).

To date, only a handful of exposures that occur in real-world competitive environments—candidate information, policy positions, and advertising tone—have been systematically tested in an experimental setting, but they have successfully and consistently induced an emotional response (Brader, 2005, 2006; Civettini and Redlawsk, 2009; Valentino et al., 2008a). The only study on political disagreement that incorporates emotional response suggests that disagreement in social networks encourages people to reassess their emotions toward both their party's candidate as well as the opponent (Parsons, 2009). I argue that we should consider a broader range of stimuli as triggers for emotion.

The Effects of Emotional Activation on Voting

There is a clear association between being cognitively engaged with politics and turning out to vote. Decades of work have shown that people who report voting are also more likely to report that they were interested in the campaign, were more likely to seek out information about the election, and were more likely to talk about politics with other people. In more recent years, we've developed an understanding of the role of emotion in political behavior, which also centers on the fact that emotional activation can facilitate certain kinds of political participation.

There is some theoretical consensus that enthusiasm and anger generally increase political participation whereas anxiety generally deflates political participation but increases interest (Huddy and Mason, 2008; Brader, 2005, 2006), though this pattern is a far from consistent empirical finding in the literature and is not entirely consistent with the original theory. Findings about the re-

relationship between negative emotions and political behavior have been more mixed than have findings about enthusiasm. People who report feeling anxious about candidates or political issues report higher levels of information acquisition, more interest in the campaign, and participation beyond voting (Marcus, Neuman and Mackuen, 2000). Subsequent work has further differentiated the effects of negative emotions, and it appears that anxiety and fear as compared to anger have distinct effects on political behaviors (Druckman and McDermott, 2008; Brader, Valentino and Suhay, 2008; Huddy, Feldman and Cassese, 2006; Lerner et al., 2003; Lerner and Keltner, 2001; Valentino et al., 2011).

Individual Differences in Negative Affectivity

In extant research, there has largely been an assumption of homogeneity in individuals' responses to environmental exposures (for an exception, see Hatemi et al. (2011)). The result of such assumptions is that contextual influences that exhibit an effect for only a subset of a population, or exhibit differing effects for different subsets, may go uncovered or may lead to contradictory results. In recent years there has been growing interest in political science in examining a role for innate differences in genetic, psychological, and personality traits in explaining variation in political behavior. A genetic basis has been established for political participation broadly (Fowler, Baker and Dawes, 2008; Klemmensen et al., 2010; Funk et al., 2010) and for voting specifically (Fowler, Baker and Dawes, 2008; Dawes and Fowler, 2009). Other behaviors and attitudes correlated with voting also have heritable components, such as strength of partisanship (Settle, Dawes and Fowler, 2009; Hatemi et al., 2009), a sense of civic duty (Klemmensen et al., 2010; Dawes et al., 2010; Dawes and Loewen, 2011), personal control (Dawes, 2010), and political interest (Funk et al., 2010). The personality and politics literature has also blossomed in recent years (Mondak, 2010; Mondak et al., 2010; Gerber et al., 2010; Gerber, Huber, Raso and Ha, 2009; Blais and Labbe-St-Vincent, 2010; Vecchione and Caprara, 2009; Gerber, Huber, Doherty and Dowling, 2009; Mondak and Halperin, 2008; Denny and

Doyle, 2008).

Thus, to fully understand the mediated relationship between competition and voting, we must also consider how individual differences could affect the way that competition influences emotional response as well as how activated emotion may have different consequences on voting behavior for different people. I am particularly interested in a person's sensitivity to threat in the environment. Psychologists have measured sensitivity to threat as part of a larger construct called negative affectivity (Watson and Clark, 1984), based on the pattern of interrelationships found between neuroticism, trait anxiety, and threat sensitivity. Negative affectivity can be measured using scales of trait-level neuroticism (Watson and Clark, 1984) and trait-level anxiety (Watson, Clark and Carey, 1988), as these traits are highly correlated with threat sensitivity. For example, people who score high on measures of negative affectivity frequently experience subjective feelings of nervousness, tension, and worry; in a given situation, they are more likely to experience a significant level of distress and thus are likely to respond more strongly to stressful situations. They are more sensitive to social cues representing both implicit and explicit threat (Hariri, 2009).

Although work in psychology has shown differential response to stimuli based on trait-level genetic, psychological and personality traits (Hariri, 2009; Norris, Larsen and Cacciopo, 2007; Rhodes et al., 2007) the emotion and politics literature has for the most part not yet considered how individual differences might affect political behavior via differences in the emotional processing of politics. The very preliminary work that does not assume homogenous emotional processing is inconclusive and has not been linked directly to voting outcomes. The only published paper (Wolak and Marcus, 2007) finds that personality seems to play more of a role in the dispositional system (the activation of enthusiasm and aversion) as compared to the surveillance system (activation of anxiety), but does not test whether personality traits moderate the expression of emotion or interact with the expression of emotion to affect anticipated campaign participation. An unpublished manuscript (MacKuen

et al., N.d.) explores moderation and interaction effects, but notes that the analysis is preliminary because of a lack of theoretical justification for testing specific interactions between personality traits and emotion. The manuscript calls for more research on how personality traits regulate, enhance, or inhibit the dual processing model of Affective Intelligence to affect behavioral choices.

More recent work in personality and politics has also exhibited similarly inconsistent results. While the work focusing on personality associations with political behavior has found fairly consistent support for the roles of four of the five traits in the Five Factor Model,¹ findings have been extremely varied with respect to neuroticism—a trait conceptually related to threat-sensitivity and trait-level anxiety. Mondak et al. (2010) find that neuroticism increases some types of political participation; other scholars find that neuroticism is inversely related with several forms of participation, including voting, contacting an official, contributing money to a candidate, and trying to persuade others to vote (Gerber, Huber, Raso and Ha, 2009; Mondak and Halperin, 2008; Vecchione and Caprara, 2009).

I argue that negative affectivity plays a role both in emotional response to the political environment and the effect of emotional activation on voter turnout. Political conflict could be more threatening to people who score highly on measures of negative affectivity, and they are thus more likely to respond with negative emotion to the perceived threat in their political environments. The experience of anxiety induced by social interactions can condition responses to events precipitating future social interactions, and this conditioned sensitivity to potentially threatening social cues varies considerably

¹There is a general consensus among personality psychologists that personality traits can be conceptualized and reliably measured in five dimensions (Mondak, 2010): extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience. *Extraversion* is marked by sociability including friendliness towards others and a desire to be in their company; *agreeableness* entails a tendency to be compassionate towards others and a willingness to cooperate; *conscientiousness* describes the degree of one's self discipline and preference for planned behavior; *neuroticism* is a tendency to experience negative emotions like anger, depression, and anxiety; *openness to experience* implies an appreciation for new and varied experiences. Further, each of these dimensions is made up of 6 subcategories. Two widely used measure of these five traits is the 240 question Revised NEO Personality Inventory (NEO-PI-R) (McCrae and Costa, 1992) and the NEO Five Factor Inventory (NEO-FFI) (McCrae and Costa, 1992).

among individuals (Hariri, 2009). Neurotic individuals are more likely to become anxious in the face of threats (Carver, Sutton and Scheier, 2000; Carver and White, 1994; Elliot and Thrash, 2002), and neurotic people have stronger and more prolonged skin conductance reactivity to emotionally evocative stimuli than do people who score low on a neuroticism scale (Norris, Larsen and Cacciopo, 2007).

Threat-sensitive individuals are also more likely to become disengaged with politics when they experience negative emotions due to political contention. One explanation for decreased political participation among those who score highly on measures of negative affectivity is that anxious people will try to avoid situations that are anxiety-inducing in order to reduce their arousal (Rusting and Larsen, 1995). Therefore, if they perceive that participating in politics is stressful, it is likely that people sensitive to threat may withdraw from the political sphere. Previous research on conflict avoidance gives some indication that this may be true. Denny and Doyle (2008) suggest that their finding of an association between the personality trait of aggression and voting could be because those who dislike conflict are less likely to be interested in politics, and therefore are less likely to vote.

Not all studies find an association between conflict avoidance and voter turnout (Ulbig and Funk, 1999; Blais and Labbe-St-Vincent, 2010), but these studies treat the political environment, and the act of voting, as uniformly contentious activities. However, studies of the political context indicate that there is variation in the degree to which politics entails conflict. As Ulbig and Funk (1999) suggest, we should only expect individual differences in conflict avoidance to be relevant when the political acts entail conflict. A study which does consider heterogeneity in political contention finds an interaction effect between conflict avoidance and cross-cutting influences, with the effects of the cross-cutting influence only affecting those who are conflict avoidant (Mutz, 2002).

An Individual Differences Model of Competition, Emotion, and Voting

I propose a model in which individual differences in negative affectivity moderate a mediated relationship between competition, emotional activation, and voting. When the competition-emotion-voting relationship is studied without controlling for these individual differences, on average it appears that emotion mediates a positive relationship between competition and voting. In actuality, the relationship is heterogeneous. Competition increases emotionality for most people, but heightened emotionality has opposite effects on the propensity to vote, depending on a person's propensity toward negative affectivity.

Theory

For the reasons described above, most people are sensitive to the level of competition in their political environment and may become increasingly emotionally activated with politics under conditions of increasing contention. It is important to note that it is likely that there are subsets of the population that are insensitive to these kinds of changes in their political environment. For example, "political junkies" who follow politics closely and care about the process of politics itself, not just the outcomes of elections, are likely emotionally invested in politics regardless of the degree of competition in their environments. However, most people are susceptible to influence from the level of contention in their environments. These people are unlikely to follow or care about politics in low stimulation environments, but are sensitive to cues in their environments and are therefore more emotionally engaged with politics in competitive environments. Their emotional response to politics partially mediates the relationship between competition and voting. In other words, the extent to which they become emotional about politics contributes to their decision to turnout and vote.

For most people, emotional activation acts as a motivator and the ex-

perience of heightened emotional arousal encourages them to become more engaged with politics. However, for people who are particularly sensitive to threat and socially stressful situations, emotion has the opposite response. First, they are more likely to respond to political competition by becoming anxious. Second, this anxiety causes politics to become overly-stimulating and they choose to withdraw from the political sphere. Because most people are positively responsive to political competition, without accounting for negative affectivity status we observe an average relationship where the level of competition in the environment is associated with increasing levels of emotional activation with politics and increasing voter turnout. However, this relationship does not hold for the minority of the population who score highly on measures of negative affectivity.

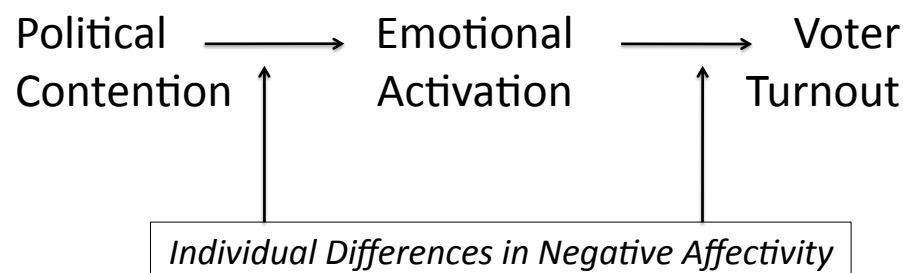
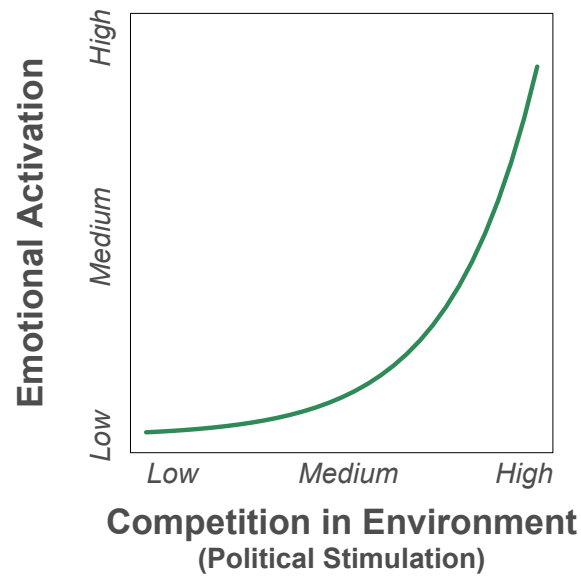


Figure 1.1: Overview of the theory in which individual differences in negative affectivity *moderate* the mediated relationship between political contention, emotional activation, and voter turnout.

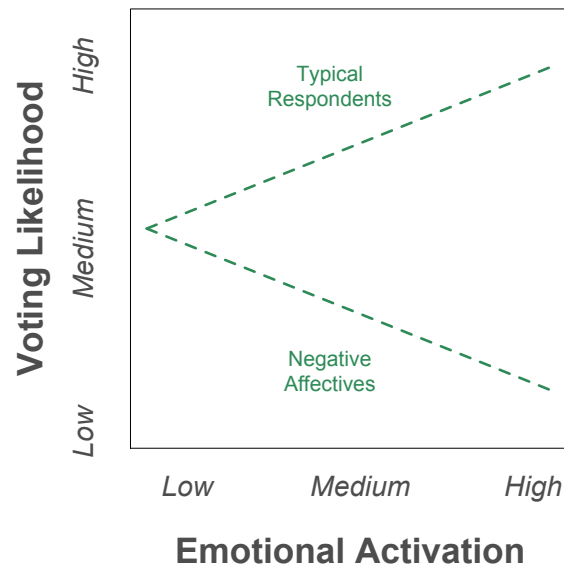
Hypotheses

Based on the theoretical predictions I outline above, I propose a series of hypotheses which will be further refined and elaborated in the empirical chapters.

Hypothesis A. Exposure to political contention increases emotional engagement with politics. Increased competition will lead to increased emo-



(a) Competition and Emotion



(b) Emotion and Voting

Figure 1.2: Schematics showing the relationship between the level of competition in the environment and the degree of emotional activation, and the differentiated relationship between emotional activation and voter turnout for those scoring high in negative affectivity compared to typical respondents.

tional response. This increased emotionality may be positive, negative, or both positive and negative. The hypothesis remains ambiguous on the specific na-

ture of emotional response because of the importance in considering how individual differences affect the interpretation of the environment. Based on the role for genes and psychological predispositions in political behavior, and on knowledge from other disciplines about how genetic influences interact with social environments (Shanahan and Hofer, 2005), it is unlikely that competition in the environment is both interpreted uniformly and has a uniform effect on emotional response.

Hypothesis B. Increased emotionality is associated with higher voter turnout, on average. Past literature has shown that increased emotionality can lead to increases in political participation. This pattern may not be true for all emotions towards all targets, or for all people for all emotions, but on average, emotional activation with politics will serve to motivate voter turnout.

Hypothesis C. Emotion mediates the relationship between competition and voting. Formal tests of mediation should reveal that increased emotionality accounts for part of the relationship between increased competition and increased voter turnout.

Hypothesis D. Negative affectives are less likely to turnout when exposed to a threatening political environment. Political competition is more threatening for those who score highly on measures of negative affectivity. Studying average relationships between political contention and emotional engagement misses the point that emotional response is heavily dependent on one's biological predispositions. The genetics and psychology literatures offer a strong basis for predicting that the political environment may trigger emotional reactions of stress and anxiety—which in turn depress the likelihood of turning out—for people who are especially sensitive to feeling threatened by their social environment.

Operationalization of Theory

The ideal dataset to test my theory would include precise measures of the degree and type of political contention in multiple aggregations of one's geographic area; a variety of measures of emotional response to multiple politically salient targets; validated voter turnout records; and genotypic and phenotypic measures of individual differences in threat sensitivity and negative affectivity. Unfortunately, no such data exists or can be easily generated. Instead I test the various parts of my theory in separate analyses using multiple datasets. The first two analytical chapters focus on the averaged relationships between competition in the environment, emotional activation, and self-reported voting. The second two analytical chapters focus on the relationships between competition and voting, accounting for individual differences in threat sensitivity and negative affectivity. Because the theory is tested in a variety of different data sources, I describe how each theoretical construct is measured in the sections that follow.

Measuring Competition

The literature studying the effects of competition in the electoral environment applies a variety of measures used to capture the level of competition or its proxies. Early studies operationalized competition using presidential election results from preceding elections (Ashenfelter and Kelley, 1975), using the closeness between parties in contemporaneous elections (Patterson and Caldeira, 1984), incorporating information about voter registration (Grofman, Collet and Griffin, 1998), or from candidate expenditures during the race (Cox and Munger, 1989). In the first empirical chapter of the dissertation, I derive my measure of competition in the spirit of this literature, using the vote differentials between the two major party presidential candidates at the state and congressional district level to capture the amount of competition in those geographic areas. In the third empirical chapter of the dissertation, I also create measures of competition based on the partisan balance of a geographic area.

In the first study in the chapter, I use the balance of registered partisans in a precinct to derive a measure of partisan heterogeneity. In the second study, I create a measure of opposition party vote share derived from the average of statewide election results in the county.

More recent work has used a proxy variable for the "battleground" concept, which captures the fact that the experience of states that are subject to intense campaigning by the presidential campaigns is qualitatively different than that of states that are essentially ignored by the campaign. It is this literature, paired with the need for a measurement strategy appropriate to a matching design, that informs my use of "battleground" status in the second empirical chapter.

Finally, the treatment in the field experiment paper is designed to make salient the notion of competition. Thus, I consider all respondents in the treatment group to have been exposed to competition, in the sense that the treatment postcard highlights the uncertainty of the outcome of the election and competitive nature of the election itself.

Measuring Emotion

A full discussion of the measurement of emotion would address the development of various theories of emotion, measurement approaches, and the validity of these techniques in comparison to one another. Here, I will focus solely on the two approaches used in this dissertation, addressing their strengths but acknowledging their weaknesses as well.

The theory of Affective Intelligence was first tested using a question from the National Election Study (NES). Respondents are asked if they have experienced each of four emotions (anger, fear, hope, and pride) toward the two presidential candidates, using a question of the form: "Has [candidate name]—because of the kind of person he is or because of something he has done—ever made you feel [angry/afraid/hopeful/proud]?" The specific emotions elicited over time have varied slightly, but the general question has remained remarkably consistent over the past three decades. Very similar question wording is

often used in many of the experiments that seek to manipulate and measure emotional response to candidates. In the first empirical chapter using NES data, I use this standard question form. Although measuring emotional activation in this way does not fully capture my theoretical construct, it does allow me to establish whether there are significant effects of competition on emotion using the measurement strategies that have been employed in past research.

However, in the second empirical chapter, I use data from Facebook in order to improve on the measurement of emotion. Emotion derived from status messages on the Facebook site are an improvement in two ways. First, status messages allow us to analyze what people are feeling, as they are feeling it. Psychologists understand the experience of emotion to be fleeting, and although the consequences of experiencing the emotion may be long-lasting, the most intense expression of the emotional reaction is captured best as it is initially experienced. By directly analyzing users' own language, we move beyond any demand characteristics present in survey or experimental studies, and gain insight into what users are feeling about politics when they are not explicitly asked about distinct emotions.

In order to analyze user language in this way, I use the Linguistic Inquiry Word Count (LIWC) text analysis process (Pennebaker, Francis and Booth, 2001). This process has become one of the most commonly used, and widely recognized, ways to assess the emotional content of written or spoken text. The LIWC software counts the frequency of words in over 70 language dimensions, including psychological processes and specific content areas. The LIWC approach has been validated using several different methods and used for measuring the emotionality of written text in dozens of academic studies (for examples, see Alpers et al. (2005); Bohanek, Fivush and Walker (2005); Burke and Dollinger (2005); Graves et al. (2005); Owen et al. (2004); Pennebaker and Lay (2002)).

The second major measurement improvement is to broaden the range of stimuli and targets to which respondents can express emotion. By looking at all politically relevant speech on the site, we can understand emotional activation

more broadly instead of solely focusing on emotion reacting to and directed toward high profile political actors.

However, there are concerns with this approach. Simply because a user does not post a status message that indicates emotional engagement with politics does not imply a lack of emotional experience, so emotional activation may be underreported using this method. Second, the public declaration of emotion to one's social connections may be distinct from the private emotion a person experiences. Interpretation of the results should keep these caveats in mind.

Measuring Voting

It is likely that emotional activation with politics is associated with an increased social desirability to report voting, and that someone who reports being emotionally engaged with the candidates or politics in general is more likely to falsely report that they have voted when they have not. Consequently, the gold standard in measuring voter turnout is the validated record as collected by a state's Secretary of State or a county's Registrar of Voters. However, relying solely on validated voter turnout narrows the universe of data sources available for study, and thus validated turnout data is not readily available for three of the four analyses in the dissertation.

In the chapter of the dissertation using Facebook data, I measure voter turnout using an unconventional approach: an "I Voted" button posted on the day of the November 2008 presidential election to both to one's profile page and posted as "news" in the newsfeeds of a user's friends. Overall, about 17% of users posted the button to their profile; of users who logged in that day, about 35% posted the button. This clearly underreports the overall voter turnout, which is to be expected given the relatively unobtrusive way in which voters were asked to report their turnout. However, at the present time, this measure of self-report is the most readily available measure of turnout for use with the Facebook data, although future studies will endeavor to validate results using a process specifically designed for matching validated voter records to Facebook users' data without identifying users' identities (Jones et al., 2011; Bond et al.,

2011).

In the second half of the dissertation, voter turnout is derived using two different ways for the two separate samples in the analysis. The data from the samples in California use validated turnout acquired from the Registrar of Voters. The data from the National Longitudinal Study of Adolescent Health uses a non-standard measure of self-reported voter turnout, simply asking "Did you vote in the most recent presidential election?" offering respondents the choice of "yes," "no," "I don't know," and "not applicable" in addition to the ability to skip the question. The question refers to the 2000 election, and was only asked of respondents who were 18 by the date of the election.

Measuring Negative Affectivity

"Negative affectivity" is a construct first coined by Watson and Clark (1984), who group the trait-level behaviors of anxiety and neuroticism into a single construct they argue is theoretically distinct and has strong validity principles. Negative affectivity is a trait that can be measured both genotypically and phenotypically. I choose to focus on the genotypic measurement of negative affectivity, as the phenotypic measures of it derived from various personality and psychological survey scales may reflect a respondent's prior exposure and reaction to political contention.

In Chapter 4, I focus on a single genetic variant that has been associated with anxiety and sensitivity to social stress, 5-HTTLPR, a polymorphic region in the SLC6A4 gene that codes for a serotonin transporter. Serotonin is a chemical that is released in the brain when a presynaptic neuron fires. After a neuron fires, it is sensed by receptors on postsynaptic neurons which uptake the serotonin. Sequential firing of neurons after each other carries signals throughout the body. In short, serotonin is centrally related to individual differences in social functioning. The 5-HTTLPR polymorphism is in the promoter region of the gene and is central in determining this reuptake of serotonin as it acts as a transporter of serotonin across cell walls. Those who have the more efficient allele are better able to reuptake serotonin into a cell where it can then be bro-

ken down. Accordingly, those with this more efficient version of the gene are thought to be better able to cope with stressful social situations. Behaviorally, short alleles are associated with great anxiety, learned fear, learned helplessness, and startle response. It is likewise associated with reduced aggression and exploratory activity.

In Chapter 5, I employ a novel approach to measuring the genetic basis of negative affectivity, creating a genetic risk index based upon the results of previous significant associations from genome wide association studies. The risk index approach has been only very recently developed, although proponents argue that it avoids many of the problems which result from overly conservative estimates of association derived from GWAS studies and insufficiently conservative estimates from candidate gene associations (Belsky et al., 2011; McCrae et al., 2010). The genetic risk index we create identifies 120 SNPs that have been found to be previously associated with negative affectivity traits, and from these SNPs and SNPs highly correlated with them creates 14 "bins." The index is constructed with one SNP from each bin. More information about the SNPs used in the construction of the index can be found in Tables 5.4 and 5.5.

Conclusion

This dissertation identifies an extant gap in the literature in exploring the role of emotion in *mediating* the relationship between competition and voting, and the role of *negative affectivity* in moderating those pathways. It draws on knowledge and techniques from political science, psychology, behavioral genetics, and computational social science to test the various pathways described in the proposed model. A full test of all the moving parts in the model remains to be addressed in subsequent research. However, the relationships and patterns revealed in the following chapters offer a compelling—albeit circumstantial—case that the way people respond emotionally to politics is a function of both their individual predispositions and the characteristics of the

environment in which they live.

Chapter 2

The Effects of Electoral Competition on Emotional Response

Background and Hypotheses

As described in the previous chapter, a persistent question in the study of political behavior is whether voters are more likely to turn out and vote in competitive elections. Previous studies have shown mixed results. Ecological and survey research often finds a small but significantly positive effect of competition—often proxied by mobilization or campaign advertising—on turnout (Patterson and Caldeira, 1983; Hoffstetter, 1973; Silberman and Durdan, 1975; Ashenfelter and Kelley, 1975; Patterson and Caldeira, 1984; Grofman, Collet and Griffin, 1998; Cox and Munger, 1989; Freedman and Goldstein, 1999; Goldstein and Ridout, 2002; Hillygus, 2005; Freedman, Franz and Goldstein, 2004; Rosenstone and Hansen, 1993; Verba, Schlozman and Brady, 1995; Huckfeldt et al., 2007). However, studies focusing on the effects of contention on individual psychological response often find that exposures typical during a competitive election—such as negative campaign advertising or social interactions with people holding diverse viewpoints—actually serve to demobilize people from voting for both cognitive and affective reasons (Festinger, 1957; Fromm, 1965; Mansbridge, 1980; Noelle-Neuman, 1993; Hibbing

and Theiss-Morse, 2002; Mutz, 2002). We are left without a clear explanation for the mechanism through which competition could mobilize people to turn out to vote.

I argue that by reconciling theories from these disparate literatures, we can better understand the heterogeneous effects of competition. In this chapter, I focus on the effect of competition on emotional response. Based on previous research suggesting that Democrats and Republicans respond differently to negative campaign advertisements (Ansolabehere and Iyengar, 1997; Baum et al., 2010), I allow for differential effects of competition based on partisan identification.

These results are consistent with earlier work but suggest that a wider range of stimuli in a competitive environment could produce similar results. Future work should elaborate on the notion of exposure to competition and contention to better understand which aspects of the environment matter most. Additional exploration of the individual differences that condition the relationship between competition and emotion would also advance our understanding of when, why and how competition matters.

The theory developed in the first chapter leads me to test a single hypothesis: being exposed to political competition will activate an emotional response to the presidential candidates, but that the type of emotional response is conditional on partisanship.

Hypothesis A: Exposure to political competition alters emotional response to presidential candidates. Democrats are likely to become more negative toward their own candidate, while Republicans are likely to become more negative toward the opposition candidate.

Methods

The main analysis of the chapter is conducted on the May 2009 release of the 2008 American National Election Study Time Series Study, designed to be representative of U.S. citizens age 18 or older as of October 31, 2008. The study

was fielded in two waves, a pre-election survey of 2,323 respondents fielded between September 2 and November 3, 2008, and a post-election survey of 2,102 of the original respondents fielded between November 5 and December 30, 2008. All interviews were administered face-to-face using Computer-Assisted Personal Interviewing technology.

The main independent variable in the analysis is the level of political competition in the 2008 presidential election in each voter's state. Data on state-level election results were acquired from the CQ Press Voting and Elections Collection. I measure this as the logged difference in vote share between the two major-party candidates, converted so that higher values on the measure correspond to states that are more competitive (i.e. states where the vote total differences between Barack Obama and John McCain were smallest). The measure is log-transformed because small differences in vote share matter more in very competitive areas than do small changes in vote share in very uncompetitive races.

In later sections of the analysis, I use two other measures of competitiveness. First, I designate each state as either being a "battleground" state or a "blackout" state in the 2008 election. This designation can be made in a variety of ways. Ideally, we would know which states the campaigns considered to be the most competitive and thus the states in which they invested the most resources, as Daron Shaw has done with earlier elections (Shaw, 1999, 2006). Alternately, five major media outlets—CNN, The Washington Post, The New York Times, MSNBC, and The Wall Street Journal—all pick states they consider to be "battlegrounds." In many years, these lists overlap considerably (see Panagopoulos (2009), page 122, footnote 2). However, there was substantial disagreement in 2008, with the most restrictive estimate from The New York Times at only six battleground states, and the most generous estimate of 21 states by MSNBC.¹ In the analysis that differentiates battleground from

¹According to The New York Times, there was agreement from CNN, The New York Times, The Washington Post, MSNBC, and the Wall Street Journal on six states: Colorado, Michigan, Nevada, New Hampshire, Ohio, Virginia. Other states that were designated battlegrounds by one or more news outlets include Florida, Indiana, Iowa, Minnesota, Missouri, New Jersey, New Mexico, North Carolina, Oregon, Pennsylvania, and Wisconsin. All other states were

blackout states, I label a state as a blackout state only if all news outlets agree that it was a blackout state.² The second measure of competitiveness uses a more localized measure of political competition, measured in the same way as state-level competition but using data about presidential vote differentials at the congressional district level.³ Data about presidential vote returns are used instead of returns for congressional candidates because they better reflect the partisan balance in a congressional district. Although these districts may not be considered competitive based on the voteshare of the candidates in the congressional race, the partisan balance in the district reveals the extent to which partisan contention may be a salient factor of the environment.

In the pre-election survey respondents were asked if they had experienced each of four emotions (anger, fear, hope, and pride) toward the two presidential candidates, using a question of the form: "Has [Barack Obama/John McCain] — because of the kind of person he is or because of something he has done — ever made you feel [angry/afraid/hopeful/proud]?" Table 2.3 and Figure 2.2 in the Appendix show the proportion of Democrats and Republicans who report experiencing each of the emotions for each candidate. Previous work suggests studying each emotional report as a distinct variable, instead of combining the emotional evaluations into a summary measure.

There are significant differences between Democrats and Republicans for each of the candidate-emotion measures in the expected direction: partisans have more positive emotion toward their party's candidate and more negative emotion toward the opposition, but there are few differences between the proportion of Democrats and Republicans that experience each emotion in response to their party's candidate. There are some differences in reported emotion toward the opposition, however. A smaller proportion of Democrats report that McCain makes them afraid compared to the proportion of Republicans who report that Obama makes them afraid. Democrats also report higher

considered "blackout" states by all news sources

²My results are not sensitive to different specifications of the "blackout." Results are virtually identical when I specify a "blackout" state as one in which up to three news outlets designate it as a "battleground" instead of a "blackout."

³Thanks to Gary Jacobson for sharing this data.

levels of positive emotion toward McCain compared to Republicans toward Obama.

Partisanship was determined by a combination of three questions⁴ to create a standard 7-point scale of partisan identification. I exclude pure independents from the analysis and consider "leaning" independents as either Democrats or Republicans. Given the importance of partisan identification in shaping emotional reactions to candidates, I code each emotion toward one's "own" candidate (Obama for Democrats and McCain for Republicans) and toward the opposition candidate (McCain for Democrats and Obama for Republicans), creating a total of eight different variables for emotional response.

All models are logistic regressions and control for the level of unemployment in the respondent's state at the time of the election,⁵ as well as the respondent's age, education (as measured by their years of schooling), income (as measured by their self-report of their estimated total income), and gender. These are all variables that could be correlated with both a respondent's state of residence and their report of emotion toward the presidential candidates. Standard errors are clustered at the state level, to control for any idiosyncrasies in a state that might uniquely affect the tested relationships. There are 1,790 respondents who are not pure independents and for whom there is complete information available for all control covariates; furthermore, there are missing values for the dependent variables for an additional 9-18 respondents. Thus, the final number of respondents in each model ranges from 1,772-1,781.

⁴Respondents were first asked, "Generally speaking, do you usually think of yourself as a Democrat, a Republican, or an Independent?" If they indicated affiliation with the Democratic or Republican party, they were then asked: "Would you call yourself a strong [Democrat/Republican] or a not very strong [Democrat/Republican]? If the respondent indicated that they were independent, affiliated with another party, or had no preference, they were asked "Do you think of yourself as closer to the Republican Party or to the Democratic party?" Response choices were randomized, and respondents were given the option to indicate another party, to give no preference, to say they didn't know, or to refuse to answer.

⁵Data were acquired from the Bureau of Labor Statistics.

Results

Competition and Emotional Response

Table 2.1 presents the results of four sets of models, two sets of models which do not incorporate information about the respondent's partisanship ("base models"), and two sets of models that have an interaction between the respondent's partisanship and the competition in their state ("interaction models"). Each set of models features separate regressions that were run for each of the four emotional categories, directed either at one's party's candidate or toward the opposition candidate.

In the base models looking at the direct effect of state-level competition on emotional response, we find that state level competition marginally increases feelings of anger toward one's own candidate, but there are no other significant relationships between competition and emotion (the rows labeled "Base Model" in Table 2.1). Running a second set of models adding an interaction term for partisan identification as a Democrat produces a markedly different pattern of results. Increased levels of competition tend to moderate Democrats' emotional evaluations of the candidates while increased competition tends to polarize the evaluations of Republicans. Put another way, when they live in competitive states, Democrats are less negative about McCain, more negative about Obama, and less positive about Obama. Republicans are more positive about McCain, less afraid (but not significantly less angry) about McCain, and more afraid of and angry at Obama. Thus, the null effects in the base model can be explained by contradicting responses to competition on the part of the two partisan groups.

The same sets of models are also run using the 2008 NES Panel Series data, using the emotional measurements taken in the September (Wave 9) panel. The same general pattern of results can be seen (see Table 2.4 in the Appendix). Additionally, in the Time Series data, the models were run separately for each candidate, and then separately for Republicans and Democrats (see

Table 2.5). The pattern of results is again generally consistent.

As seen by the main effects of Democratic partisan identification in the models and evidenced by the proportions of partisans who express emotion toward the candidates in Figure 2.2 in the Appendix, there are some important mean level differences in emotional response to the candidates between partisans. Democrats are less hopeful about McCain than Republicans are about Obama, on average, and Democrats are more likely to report being afraid or proud of Obama than Republicans report about McCain. Thus, in Figure 2.1, it is important to focus on the slope of the lines and magnitude of the first difference effects, which demonstrate the effect of competition on emotional evaluation. For example, Republicans living in very competitive areas are significantly more likely to be angry at Obama than are Republicans living in low levels of competition. However, they are no more likely to be angry at Obama than are Democrats at McCain in states with very competitive elections. Similarly, Republicans in competitive areas are much more likely to report being proud of McCain than Republicans living in uncompetitive areas, while Democrats in competitive areas are less likely to report being proud of Obama than are Democrats in less competitive areas.

Table 2.1: Effect of state-level competition on reported emotion toward the candidates of the respondent's own party and the opposition party. For each candidate type-emotional response combination, (i.e. Own Candidate Anger), the results of two separate regressions are reported. The regression in the "Base Model" row shows the effects of state-level competition on the specified emotion for the respondents' own or opposite candidate. The second set of results in the rows labels "Interaction Models" show the coefficients for the key explanatory variables where competition and Democratic partisanship are interacted to predict the emotional response.

	Anger	Afraid	Hope	Proud
Own Candidate				
<i>Base Model</i>				
Competition	0.996 [†] (0.764)	0.790 (0.763)	0.348 (0.730)	0.648 (0.760)
<i>Interaction Model</i>				
Competition	-0.837 (0.861)	-2.009 * (0.925)	2.343 * (1.182)	3.005 *** (0.817)
Dem. Main Effect	0.304 (0.292)	0.929 *** (0.242)	-0.146 (0.463)	-0.508 ** (0.170)
Interaction Effect	3.989 ** (1.400)	5.788 *** (1.436)	-4.327 * (2.038)	-4.839 *** (1.067)
Opposition Candidate				
<i>Base Model</i>				
Competition	0.451 (0.599)	0.378 (0.464)	0.665 (0.620)	0.462 (0.544)
<i>Interaction Model</i>				
Competition	2.329 * (1.049)	1.205 * (0.655)	1.049 (0.929)	0.053 (0.799)
Dem. Main Effect	-0.319 [†] (0.224)	-0.325 (0.303)	-0.776 ** (0.259)	0.376 (0.326)
Interaction Effect	-3.425 ** (1.257)	-1.728 [†] (1.216)	-1.328 (1.608)	0.977 (1.946)

[†] significant at $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

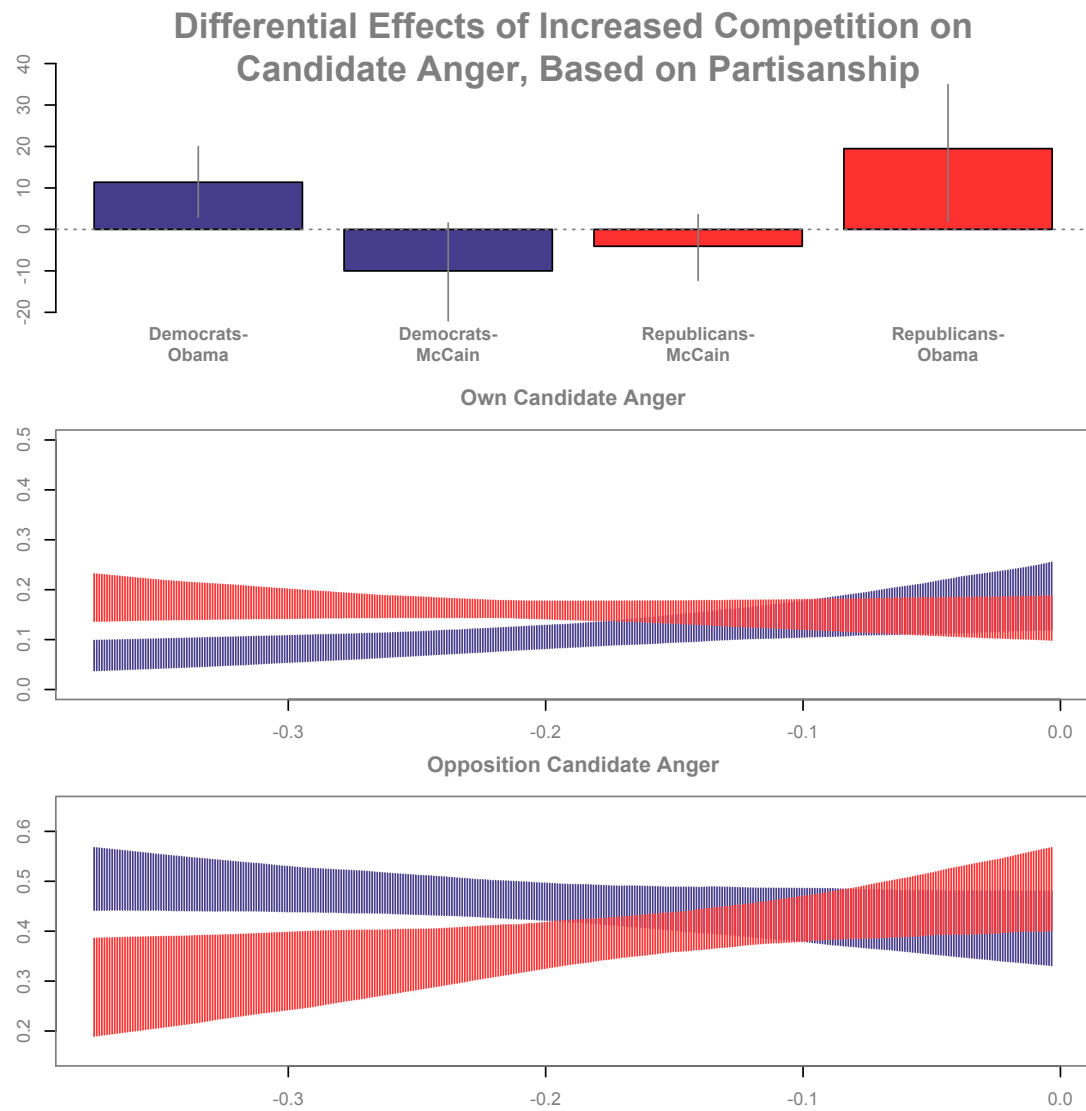


Figure 2.1: Panel A shows the change in predicted probability of expressing anger, moving from a state with the lowest level of competition observed in the data to the highest level of competition observed in the data. Panels B and C show the predicted probability of emotional expression for one's own candidate (B) and the opposition candidate (C), over the range of levels of competition in the states in the sample and separated by the partisan identification of the respondent. Predicted probabilities are shown in red for Republicans and blue for Democrats.

Campaign Effects, or Something More?

The results presented in the first section suggest that state-level political competition can alter people's emotional evaluations of the presidential candidates. However, highly competitive states receive disproportionate campaign spending, and thus the effects of competition at the state level may be in large part due to campaign effects. The first set of findings reported in Table 2.1 may simply confirm that campaign advertisements affect emotional evaluations of presidential candidates. My theory suggests that other aspects of competition could matter besides campaign effects, namely exposure to a politically divisive environment and more social interactions with people who hold opposing political beliefs. Ideally, I would use a more local level measure of partisan competition, such as competition at the precinct or neighborhood level, which is likely more correlated with the kinds of daily exposures that might affect emotionality. However, that level of data is not available to match into the NES data, and thus I use a measure of the presidential vote share measured at the congressional district level. This variable captures the amount of partisan competition more accurately than the congressional vote share and more locally than the state presidential vote share.⁶ Congressional districts are still large units: in small states, districts are synonymous with the boundaries of the state itself and congressional districts can be larger than counties in sparsely populated areas. However, the congressional district is a relevant political boundary for political competition, more so than the county.

State and district level competition are correlated, and therefore it would be hard to isolate the effect of competition at a more local level as intense campaigning in battleground states may mask the effect of competition at a more local level. Thus, to test for district-level effects, I study the effects of district level variation in states that are uncompetitive at the state level, the blackout states. While the design of this study does not permit testing the specific mechanism of the effect in these blackout states, we can be confident

⁶Another source of data that could be used to capture this construct is data about partisan registration in each state, but this data is only available for a subset of states.

that the effect of competition here is not due solely to campaign advertisement effects.

I repeat the analysis I described above. In the base models, competition has significant effects for seven of the eight emotional responses, all in the direction of the pattern we observed for Democrats responding to state-level competition. Many of the significant interactions are maintained (Democrats are less likely to be afraid of McCain and more likely to be proud of McCain, while Republicans are more likely to be angry at Obama) and a few are only marginally significant (Republicans' reduced pride in Obama, Democrats' increased fear toward Obama, and their reduced pride in Obama). While the pattern of interaction results are weaker, the results of the combined regressions are consistent with work by Parsons (2009) who finds that interpersonal discussion has moderating effects on emotional response for both Democrats and Republicans.

Table 2.2: Effect of district-level competition on reported emotion towards McCain and Obama, looking only at respondents living in "blackout" states. The regression in the "Base Model" row is the base model regressing district-level competition on the specified emotion for the respondents' own or opposite candidate. The second set of results show the coefficients for the key variables in an interaction model where competition and Democratic partisanship are interacted to predict the emotional response.

	Anger	Afraid	Hope	Proud
Own Candidate				
<i>Base Model</i>				
Competition	0.516 *** (0.138)	0.549 (0.442)	-0.812 ** (0.283)	-1.369 ** (0.447)
<i>Interaction Model</i>				
Competition	0.595 * (0.326)	-0.020 (0.694)	-0.747 (0.676)	-0.825 [†] (0.518)
Dem. Main Effect	-0.294 (0.247)	0.076 (0.269)	0.705 ** (0.242)	0.021 (0.259)
Interaction Effect	-0.224 (0.491)	0.822 [†] (0.640)	0.220 (0.755)	-0.850 [†] (0.589)
Opposition Candidate				
<i>Base Model</i>				
Competition	-0.488 * (0.270)	-0.387 ** (0.132)	0.533 ** (0.176)	0.444 *** (0.108)
<i>Interaction Model</i>				
Competition	-0.215 (0.302)	0.291 (0.328)	0.369 (0.311)	-0.395 (0.339)
Dem. Main Effect	0.159 (0.201)	-0.626 * (0.319)	-0.372 (0.292)	0.516 [†] (0.333)
Interaction Effect	-0.274 (0.711)	-1.093 * (0.583)	0.072 (0.381)	1.374 ** (0.549)

[†] significant at $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Discussion

The results of this chapter reveal a complicated set of relationships between the level of competition to which a person is exposed and their emotional evaluations of the presidential candidates. Democrats and Republicans seem to have opposite emotional responses to state-level competition. Democrats appear to moderate their emotional evaluations, tending to become more negative about Obama and more positive about McCain. Republicans tend to become more extreme in their emotional evaluations, becoming more negative about Obama and more positive about McCain. This pattern of partisan difference is less pronounced with examining the effects of presidential competition at the congressional district level. It appears that, consistent with earlier work that examines one mechanism of competition at a more local level (Parsons, 2009), competition may have some tempering effects on emotional evaluation for both Democrats and Republicans.

This analysis is a first step toward understanding the potential role of emotion in mediating the effects of competition. That such a blunt measure of political competition as party vote share differential has a robust and significant effect on emotional evaluations—an effect that likely cannot be explained away simply by campaign effects—is encouraging in the effort to pursue the study of the full mediated model between competition, emotion, and voting. However, this analysis raises more questions than it answers.

First, the partisan effect, while consistent with previous literature which shows that Republicans and Democrats have different responses to negative campaign advertising (Ansolabehere and Iyengar, 1997; Baum et al., 2010), may be an effect unique to 2008. Polling from late October 2008 shows that seven out of ten Americans expected Barack Obama to win the election (Newport, 2007). The extent to which this expectation shaped the way that competition affected emotional response is unknown, but it may be the case that we observe this effect because Republicans were the "underdogs" in this particular election.

However, it is possible that this effect may generally hold, and that the effect being captured by partisanship may be picking up a more underlying

trait, which differs on average between Republicans and Democrats. There is some evidence that there are salient differences between liberals and conservatives on the need to manage uncertainty and threat (Jost et al., 2007, 2003), openness to experience (Jost et al., 2003), and dogmatism (Jost et al., 2003). Psychophysiological approaches suggest that conservatives may be more attentive to angry or aversive stimuli (McLean et al., 2011; Dodd et al., 2011). While research has focused on the differences between political conservatives and liberals, these ideological differences map increasingly strongly onto partisan identifications. Unfortunately, the 2008 NES data used in this chapter do not have measures of individual differences in personality or threat sensitivity to test this, but future analysis will address whether these differences in emotional response are due to something more innate than partisan identification.

Second, the measures of emotion are not a good representation of the theoretical construct. Presumably there are many reasons why a person may experience an emotion directed at the presidential candidates. Democrats who report anger or fear at Obama may be doing so for very different reasons than are Republicans. Furthermore, the presidential candidates may not be representative targets for emotional activation as well. A better measure would capture emotional activation in politics more broadly. With this goal in mind, I turn toward a richer data source to evaluate how emotional activation mediates exposure to competition and voting.

Appendix

Table 2.3 and Figure 2.2 show the proportion of partisans who report emotional activation to the candidates.

Table 2.3: The proportion of partisans who report emotional activation to the candidates. 95% confidence intervals are used for the proportion estimates.

	Proportion of Partisans	Lower CI	Upper CI
Republican Anger at McCain	16.67	13.45	20.47
Democrat Anger at McCain	44.11	41.03	47.25
Republican Anger at Obama	45.83	41.19	50.55
Democrat Anger at Obama	11.98	10.09	14.16
Republican Fear of McCain	12.73	9.91	16.21
Democrat Fear of McCain	43.91	40.83	47.04
Republican Fear of Obama	59.26	54.56	63.79
Democrat Fear of Obama	13.51	11.51	15.80
Republican Hope for McCain	80.56	76.56	84.01
Democrat Hope for McCain	21.19	18.74	23.86
Republican Hope for Obama	30.09	25.96	34.58
Democrat Hope for Obama	84.75	82.36	86.87
Republican Pride for McCain	82.18	78.29	85.50
Democrat Pride for McCain	29.38	26.60	32.31
Republican Pride for Obama	21.99	18.34	26.13
Democrat Pride for Obama	75.95	73.17	78.52

Table 2.4 replicate the results reported from regressions in Table 2.1, but instead use data from the 2008-2009 NES Panel Data Study.

Table 2.5 shows the results of six separate sets of regressions looking at the effects of state-level competition on emotional response toward each of the presidential candidates. The regressions comport with the results that competition moderates Democrats' emotional evaluations and polarizes Republicans': in the models that include all respondents, competition decreases negative emotion toward McCain and positive emotion toward Obama, and increases

positive emotion toward McCain and negative emotion toward Obama.

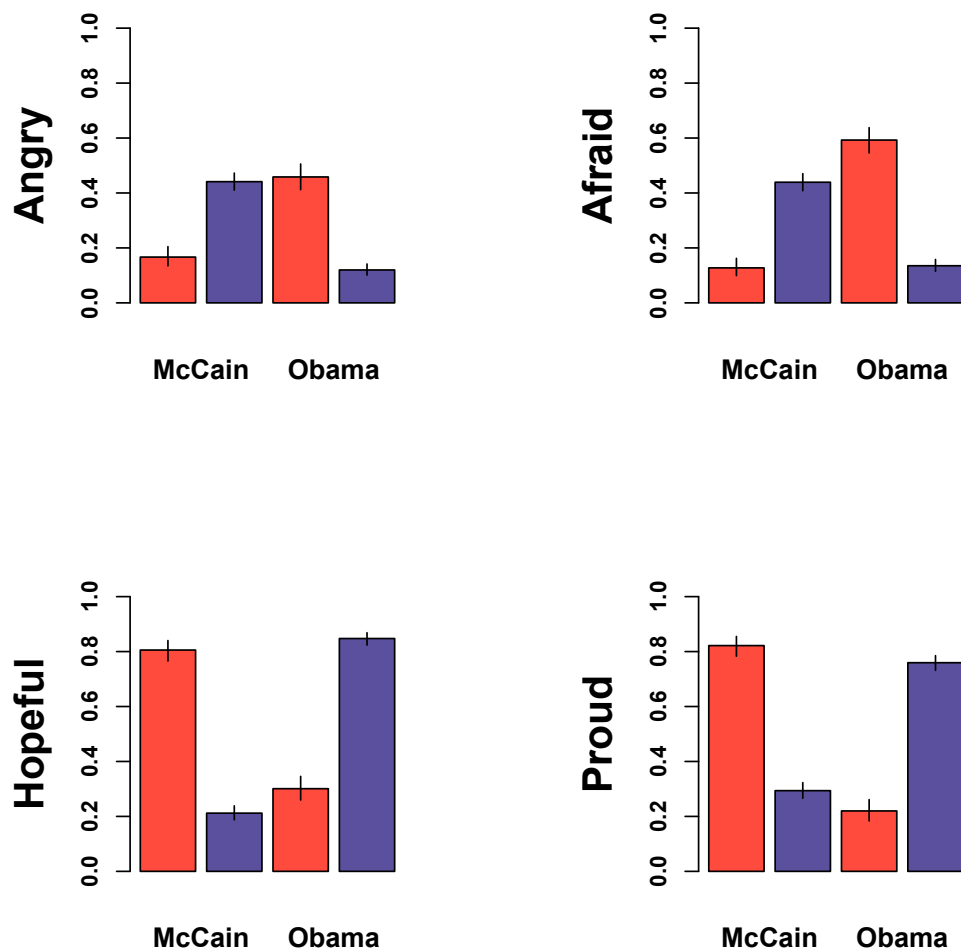


Figure 2.2: Emotional expression for presidential candidates, by party identification of the respondents. Partisans have more positive emotion toward their party's candidate and more negative emotion toward the opposition, but there are few differences between the proportion of Democrats and Republicans that experience each emotion in response to their party's candidate. A smaller proportion of Democrats report that McCain makes them afraid compared to the proportion of Republicans who report that Obama makes them afraid. Democrats also report higher levels of positive emotion toward McCain compared to Republicans toward Obama. Republicans are shown in red (lighter) and the Democrats in blue (darker).

Table 2.4: Replication results for Table 2.1, using data from the 2008 NES Panel Series Study, showing the effect of state-level competition on reported emotion toward the candidates of the respondent's own party and the opposition party.

	Anger	Afraid	Hope	Proud
Own Candidate				
<i>Base Model</i>				
Competition	0.290 (0.510)	-0.360 [†] (0.251)	-0.388 (0.762)	-0.535 (1.065)
<i>Interaction Model</i>				
Competition	0.126 (1.070)	-0.628 (1.137)	2.539 [†] (1.650)	2.545 [†] (1.817)
Dem. Main Effect	0.019 (0.329)	0.778 ^{***} (0.251)	-0.581 [†] (0.438)	-1.385 ^{**} (0.507)
Interaction Effect	0.205 (1.287)	0.533 (1.146)	-4.339 [*] (2.581)	-4.437 [*] (2.312)
Opposition Candidate				
<i>Base Model</i>				
Competition	0.057 (0.382)	0.026 (0.571)	0.333 [†] (0.207)	-0.454 [*] (0.239)
<i>Interaction Model</i>				
Competition	1.079 (1.291)	2.343 [*] (1.014)	0.710 (0.935)	-0.763 (0.794)
Dem. Main Effect	0.345 [†] (0.257)	-0.393 [*] (0.238)	-0.576 ^{**} (0.197)	-0.142 (0.230)
Interaction Effect	-1.302 (1.378)	-3.013 ^{**} (1.154)	-0.264 (1.040)	0.622 (0.826)

[†] significant at $p < .10$; ^{*} $p < .05$; ^{**} $p < .01$; ^{***} $p < .001$

Table 2.5: Effect of state-level competition on reported emotion towards McCain and Obama. Each cell in the table represents a separate regression, and reports the coefficient and standard error of the state-level competition variable on the emotional evaluation of the candidate (Obama or McCain). Row labels indicate which set of respondents were included in the regression. All regressions include the level of unemployment in the respondent's state at the time of the election, as well as the respondent's partisanship, age, education levels, income, and gender. Standard errors are clustered at the state level.

	Anger	Afraid	Hope	Proud
Mccain				
All Respondents	-1.257 ** (0.511)	-0.826 * (0.454)	1.278 † (0.795)	1.402 * (0.663)
Republicans	-1.128 (1.275)	-0.560 (1.123)	1.087 (1.487)	1.269 (1.786)
Democrats	-0.813 (0.686)	-0.491 (0.813)	0.010 (0.935)	0.889 (1.032)
Obama				
All Respondents	2.025 ** (0.681)	1.970 ** (0.808)	-0.263 (0.722)	-1.309 † (0.847)
Republicans	1.758 * (0.956)	0.683 (1.402)	1.314 (1.572)	-0.319 (1.489)
Democrats	2.479 * (1.253)	3.177 *** (0.813)	-0.770 (0.876)	-3.029 *** (0.916)

† significant at $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Chapter 3

Day-to-Day Political Engagement Partially Mediates the Effect of Competition on Voting

Introduction

The authors of *Voting* (Berelson, Lazarsfeld and McPhee, 1954) sought to study the dynamic process of how people arrive at their political decisions, emphasizing the need to analyze behavior and opinion over the course of an election season, and ultimately over the course of years and even decades. Panel studies revolutionized the field of political behavior and opened doors to asking and answering a much richer set of questions about the development and change of political engagement, and subsequent studies have contributed greatly to our understanding of the dynamics of public opinion, vote choice, and the decision to vote. Yet challenges remain that have kept us from fully understanding the microfoundations of change and how people think, feel, and act politically on a daily basis when they are not being asked to reflect on their opinions and behavior in a survey. Advancements in survey techniques have significantly reduced measurement error, but ultimately survey questions rely on the hindsight self-reports of participants. Furthermore, panel data collection

is expensive and difficult, and there is almost always a tradeoff between the number of panel waves and the number of respondents or questions included in the study.

The advent of computational social science techniques, paired with a variety of new data sources, offer the possibility of moving beyond snapshots to a minute-by-minute motion picture of the dynamic political engagement of the American public (Lazer et al., 2009). For the first time, we can capture what people are thinking and talking about with regard to politics as those opinions and conversations are formed. We can examine in fine grain detail how people respond to the broader political environment, to campaigns and the media, and to their personal social networks. Data generated from sources such as Facebook, Twitter, web searches, and blog postings allow us to study how people engage with politics instead of how they *report* they engage with politics, freeing us from the complications of social desirability bias, the Hawthorne effect, and false recall. Additionally, the scale of this data and the ability to study whole populations instead of representative samples frees us from relying on parametric analysis and the subsequent assumptions we are forced to make in parametric data modeling. In other words, we can come closer to realizing the long-desired goal of characterizing political behavior as it happens—while it happens—in the real world.

We apply these new techniques to a persistent question in the study of political behavior: how does the level of competition in the electoral environment affect an individual's engagement with politics? A unique collection of the universe of Facebook status messages allows us to study the dynamics of political engagement as they unfold during the course of the election season, comparing people in states where the 2008 presidential election was fiercely contested to people in states which were essentially ignored by the McCain and Obama campaigns. This paper finds that *day-to-day engagement* with politics—in the form of posting political status messages—mediates a large portion of the relationship between exposure to political competition and self-reported voter turnout. Users who live in politically competitive, or "battleground" states, are

more likely to discuss politics in the campaign season—and to do so in an emotional manner—than are those users who live in "blackout" states. Posting a political status message has a large and significant effect on a person's likelihood of reporting that they voted on Election Day, and emotional and cognitive political status message posting mediate approximately 31% of the relationship between battleground status and reported turnout. These results have important implications for understanding *how* competition has an effect on political engagement.

Background

Facebook: An Online Social Networking Platform

The Internet has revolutionized the way people engage with the social and political world. In particular, the growth of social networking websites, such as Facebook, can enhance social connection and community engagement.¹ The use of social network sites has exploded in recent years and a diverse group of people and communities are now connecting through these sites in order to complement or enhance their offline social connections. The social network site Facebook was created in 2004 and was initially limited to college and university students. It has become extremely well integrated into the college experience, and it is estimated that about 90% of all college students have a profile on Facebook or another social networking site. Once Facebook opened up access to any user with an email address, the growth of the site increased exponentially to nearly 700 million in July 2011 (100 million in the United States alone) and Facebook is currently adding approximately one million new users a day. The increase in social networking use has been most pronounced in the last three years among users over the age of 35, and over half of all adult social network users are now over the age of 35 (Hampton et al., 2011).

¹A social network site is a type of website with user profiles, semi-persistent public commentary about the content of those profiles, and a social network displayed in relation to that profile. Social network sites are dynamic entities that are meant to be evolving representations of one's self and one's real life social network.

Since the development of social networking sites about a decade ago, scholars have studied how online social networking complements or detracts from the quality of social networks and engagement in the "real world." Internet use supplements face-to-face and telephone contact and is especially useful to maintain ties with friends (Wellman, Witte and Hampton, 2001), and most relationships formed online continue with a mixture of online and offline interaction (Wellman, Witte and Hampton, 2001; Rheingold, 2000; Muller, 1999), which indicates the potential for the network created on Facebook to influence real life. Most studies that use Facebook data have either surveyed Facebook users (Lewis et al., 2008; Vitak et al., 2011; Goodman et al., 2011; Feezell, Conroy and Guerrero, 2009) or scraped information from publicly available profile pages (Fernandes et al., 2010). Small studies based on self-report indicate that online networking sites may have positive impacts on political participation (Feezell, Conroy and Guerrero, 2009), and may foster online political discussion (Kushin and Kitchener, 2009). The use of the Internet to develop "weak ties" within one's residential neighborhood has also been demonstrated, which in turn facilitates discussion and mobilization around local issues (Hampton and Wellman, 2001).

A collaboration with the Facebook Data Team has allowed us to analyze user characteristics and engagement in accordance with Facebook's policies regarding the protection of user privacy. Facebook is especially suited to the study of people's daily engagement with politics because of the way it has become integrated into the lives of internet users of all ages. According to Hampton et al. (2011), 52% of Facebook users engage with the site on a daily basis, and another 32% use the site at least once a week. Furthermore, unlike other sources of large-scale data, due to its standardized profile template, which includes information about a user's age, gender, and education level, Facebook contains enough data about users themselves to incorporate well-established theories—such as the fact that political engagement is correlated with sociodemographic factors and the behavior of people in one's social network—into our analysis.

A major way that Facebook users interact is to share their status with other users, and in this paper we analyze a sample of all the status messages that were posted during the 2008 election season. Typically, a "status message" is a short note about an activity that the user is engaged in, or how the user is feeling. We argue that Facebook is a valid forum for discussion in general and for political discussion specifically. As we demonstrate below, for many users, posting a status message is a regular part of their engagement with Facebook. A recent report from the Pew Research Center's Internet and American Life Project asserts that on an average day, 15% of users update their own status and 22% comment on their friends' statuses. Approximately 73% of users report updating their status at least once a week (Hampton et al., 2011). If Facebook users are affected by politics, it is reasonable to think that they might express that by posting a status message that is political in nature. The unobtrusive design of our study also grants us access to behaviors that can be difficult to measure with survey questions designed to recall past behaviors or opinions.

The Mediating Role of Emotional and Cognitive Engagement on Self-Reported Turnout

Previous research leads us to expect that heightened political competition will have a direct effect on users' self-reported voter turnout. This work is based primarily on voter recollection and self-report, and emphasizes outcomes at the end of the election season. We move beyond direct effects of competition to look at mediating factors which could explain the direct relationship. If competition affects turnout via increased cognitive and emotional engagement with politics, then we expect to see a strong relationship between engagement in the campaign season and voter turnout. There is strong support in the literature for a relationship between being cognitively engaged with politics and turning out to vote and similarly, our understanding of the role of emotion in political behavior also centers on the fact that emotional activation can facilitate political participation.

However, we know very little about the day-to-day ways in which peo-

ple experience politics and whether they are responsive to the level of competition in their environment throughout the campaign season. Studying political behavior on Facebook allows us to test the extent to which emotional and non-emotional engagement with politics, as measured by status message posting, mediates the relationship between exposure to competition and self-reported voter turnout. To test the Baron and Kenny (1986) mediation model, we must first establish relationships between our key variables. Cognitive or emotional engagement *mediates* the relationship between exposure to competition and self-report turnout if a) competition significantly predicts cognitive or emotional engagement, and b) cognitive or emotional engagement significantly predicts self-reported turnout, controlling for exposure to competition. We formalize these relationships in our hypotheses, and explain the operationalization of our concepts in the next section of the paper.

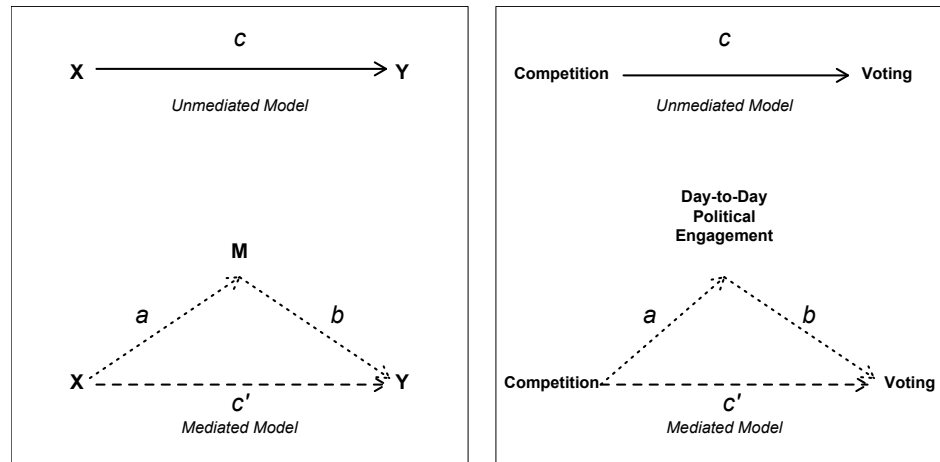
H1: Users in the battleground are more likely to click the "I Voted" button on Election Day.

H2.1: In the campaign season, a greater proportion of people living in battleground states will make at least one political status message compared to people not living in the battleground.

H2.2: In the campaign season, a greater proportion of people living in battleground states will make at least one emotional political status message compared to people not living in the battleground.

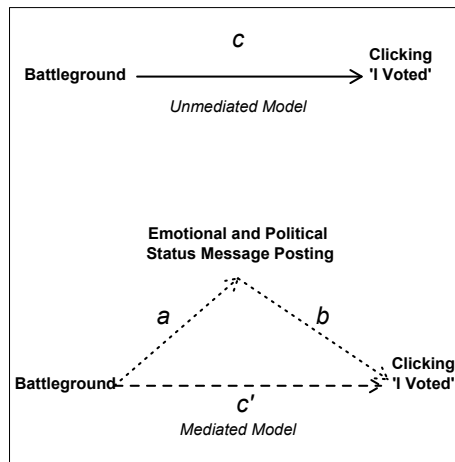
H3: Users who have posted political status messages—emotional or not—in the campaign season will be more likely to click the "I Voted" button on Election Day.

H4: Status message posting in the campaign season mediates the relationship between exposure to competition and self-reported voter turnout.



(a) Baron and Kenny (1986) Model

(b) Conceptual Framework



(c) Operationalized Framework

Figure 3.1: The full mediated model explaining the role for emotional and cognitive engagement with politics as mediators between exposure to competition and voting

Data and Methods

Sample

The Facebook Data Team has data on the universe of status messages made by Facebook users during the 2008 election season, and a collaboration with them has allowed us to test the hypotheses outlined above.² We select five battleground states and five blackout states for study. The battleground states (Florida, Indiana, Missouri, Ohio, and Virginia) were selected because each state received many visits from the candidates, there were a large number of field offices in the state, and the final vote total between the two major presidential candidates was very close. The blackout states (California, Kentucky, Louisiana, Massachusetts, and Oregon) were chosen for the opposite reason: they saw very little campaign activity during the 2008 season. However, there is great variation in population size (and thus Electoral College votes), turnout rates, and historical competitiveness within each group of states. Tables 3.7, 3.8, and 3.9 in the Appendix have information about the characteristics of the sample, electoral campaign, and election in each state.

We restrict the sample to users who had active accounts on January 1, 2008 and who were at least 18 years of age by that date, and we randomly sample 200,000 people from each of the 10 states. We determine a user's state of residence based on their IP address for the earliest date for which this measure is available, February 15, 2010.³ Table 3.5 shows the balance in key covari-

²Data were collected and analyzed in accordance with the Facebook privacy policy and with UCSD IRB protocol #101273. All data acquisition occurred on Facebook secure servers on Facebook property where the information already resides and is already protected by stringent security measures. Data were piped directly from the data warehousing infrastructure to the coding program so that no status update was ever seen by a researcher during the analysis. Aggregated data for analysis were deidentified prior to leaving Facebook property in such a manner that subjects cannot be identified directly or through identifiers in order to prevent information about individual users from being shared without their permission. Users who do not wish to have their data analyzed by third parties may delete their accounts with Facebook in accordance with Facebook's Terms of Service.

³We chose to use IP address because of the high degree of missingness in self-reported "Current Location," which is likely systematic but in unknown ways. The duration of time between our measurement of a user's state and the study period will add noise to our results as people moved between 2008 and February, 2010. However, this should not bias our results

ates between users in the two groups of states, and Table 3.6 shows summary statistics about each state's Facebook user demographics and Facebook usage patterns. We define the pre-campaign season as the period January 1st-August 24th, 2008, the day before the beginning of the Democratic National Convention. We define the campaign season as August 25th-November 3rd, 2008.

To determine the effect of living in the battleground on status message posting and on voter turnout, we then employed an exact matching procedure, using battleground status as the treatment variable. The sample was matched on age, gender, education level, the total number of status messages posted in the pre-campaign season (converted to an ordinal variable by vigintile), and the total number of friends on January 1, 2008 (converted to an ordinal variable by vigintile).⁴ These covariates were selected because they could influence the proportion of a user's posts that are political and could be significantly different between users in the battleground and blackout states. For example, younger people post more status messages and people with a college education are more likely to be engaged with politics. If battleground status is correlated with the age or education level of the population, we would not be able to isolate the effect of political competition from the effects of the demographics of users in the state.

The exact matching procedure utilized in MatchIt (Ho et al., 2007, 2011) matches each user in the battleground to all possible users in the blackout that have the same values on the covariates, creating subclasses where each unit in the subclass has the exact same values on the covariates. Because of the large number of respondents in our original dataset (2 million users), we choose to use exact matching to create a dataset that can be analyzed without imposing

and should blur differences between battleground and blackout states, making it harder to find effects.

⁴Vigintile variables—dividing the distribution into twenty groups of equal frequency—were created for theoretical reasons. For example, one of the vigintiles contains all users who made between 3 and 7 status messages in the pre-campaign season, which we feel represents very similar levels of engagement with the Facebook site. An exact matching procedure was conducted using the full count variables, but the resulting matched sample looked very different than the original sample of users because of the overselection of users that had few friends and posted few status messages

model assumptions onto the data. This procedure reduces the number of users in the sample by approximately 5% and we are left with 952,923 users in the battleground and 949,124 users in the blackout states for a total of 1,902,047 users.

We then collect all status messages that the users in the matched sample posted between January 1, 2008, and January 31, 2009, encompassing the primary season, the campaign season, and the inauguration of President Barack Obama, a total of 113,660,429 messages. Figure 3.2 shows the growth of status messaging over time, both in the number of users who post at least one status message in a given month and in the number of status messages made in the sample. In total, 58,851,519 messages were made by users in the battleground and 54,808,910 messages were made by users in the blackout. Of the original matched sample of 1,902,047 users, 1,439,780 (75.69%) posted at least one status message during the study period; 726,590 of 952,923 users (76.25%) in the battleground made a post, while 713,190 of 949,124 users (75.14%) made a post in the blackout.

The top panel in Table 3.1 shows the overall balance between treatment and control groups after the matching procedure. The lower panel of Table 3.1 shows the balance for those users who posted at least one status messages during the study period. These users are slightly younger, slightly more educated, and slightly more engaged with Facebook (i.e., have more friends and post more messages) than are users in the overall matched sample. However, the balance tests reveal that there are only small differences in means between users in the blackout and battleground on the factors that could contribute to political posting—age, gender, education, and general engagement with Facebook.

Quantifying Political Discussion

Automated textual analysis is a tool originally developed by computer scientists for the purpose of classifying large numbers of individual documents

(Hopkins and King, 2010). Content analysis procedures have rapidly advanced in recent years as the scope and scale of data available for analysis has exceeded the limits for which it is feasible to employ human coders (Lyman and Varian, 2003; King and Lowe, 2003). In line with the work in this literature, we employ a machine-learning algorithm in order to determine the predicted probability that a status message is political in nature. More specific details about the process and comparisons to alternative approaches can be found in Fariss et al. (2011). In brief, we used a collection of 467 million English-language Twitter posts from 20 million users covering a seven-month period between June 1, 2009 to December 31, 2009 (Yang and Leskovec, 2011). This represents approximately 20-30% of all public tweets posted on Twitter during this time frame. Of these tweets, 31,000 had been "hashtagged" as "politics,"⁵ meaning that the user who posted the tweet believed the topic to be political in nature. We then trained a machine-learning algorithm on these 31,000 tweets and 31,000 randomly selected tweets that were not hashtagged "politics" in order to identify which words meaningfully distinguished the two categories of tweets. Using this dictionary of terms in a logistic regression to predict the hashtag "politics" returned coefficients for approximately 1,000 words which were informative in predicting whether a tweet is political. We then coded the predicted probability of "politicalness" for each of the 113,660,429 status messages in the sample, resulting in a political score between 0 and 1. A status message was considered political if it had a score of 0.75 or higher. As shown in Fariss et al. (2011),⁶ the results conform closely to our expectation: a growing percentage of status messages are political between August and November, with a sharp decline in political speech after the election. The measure is responsive to changes in the political environment, such as important political milestones like the "Super Tuesday" primary election day, the day Barack Obama secured the Democratic nomination, and the day of the inauguration.

⁵#politics

⁶The key tables and figures are also shown in the Appendix of this paper for interested readers.

Quantifying Emotional Discussion

The Linguistic Inquiry Word Count (LIWC) text analysis procedure (Pennebaker, Francis and Booth, 2001) has become one of the most commonly used, and widely recognized, ways to assess the emotional content of written or spoken text. The LIWC software counts the frequency of words in over 70 language dimensions, including psychological processes and specific content areas. The LIWC approach has been validated using several different methods and used for measuring the emotionality of written text in dozens of academic studies (for examples, see Alpers et al. (2005); Bohanek, Fivush and Walker (2005); Burke and Dollinger (2005); Graves et al. (2005); Owen et al. (2004); Pennebaker and Lay (2002)).

The LIWC measures both positive and negative emotions, and further differentiates negative emotions into anxiety, anger and sadness. The dictionaries used to code for emotionality were incorporated into an algorithm to code the corpus of Facebook status messages. Status messages were coded both for overall positive and negative emotions as well as for the subfacets of anger and anxiety. A political status message was determined to be emotional if it scored greater than 0.75 on the political measure (the measure is scored from 0 to 1) and used one or more emotional words. The message was then further differentiated as being a positive, negative, angry or anxious message if it met the criteria for being political and had at least one word in the specific category of the LIWC score. Messages can have non-zero counts for both positive and negative emotions if words coding for both sentiments are used, and we did not restrict a post to being only positive or negative. Table 3.2 shows summary statistics for emotional message posting over the course of the study period.

Emotional discussion about political topics appears to be somewhat different than emotional discussion of non-political topics. A slightly greater proportion of political conversation is negative—both angrier and more anxious—but of those users who post at least one political message, significantly fewer of them post an emotional political message as compared to the analogous pro-

portion of people who post an emotional non-political message (Figure 3.2). Perhaps surprisingly, political speech is very emotional even in the absence of a political campaign, in terms of both the overall quantity of discussion as well as the proportion of users who post an emotional political status message (Figure 3.3). More detailed visualization of emotional political speech over the course of the study period is shown in the Appendix in Tables 3.11, 3.12, and 3.13.

Measuring Self-Reported Voter Turnout

On November 4th, 2008, Facebook posted a statement at the top of a user's "News Feed" (the home page that greets users upon entering the site). This message encouraged the user to vote and showed a clickable button reading "I Voted." Of all the users in our sample, 17.28% clicked the "I Voted" button. Approximately 49.40% of users in our sample logged in on Election Day; of those users who logged in, 35.02% clicked the button.

Clicking the "I Voted" button is similar to traditional measures of self-reported voting. However, unlike other studies where the respondent reports their voting behavior to a survey administrator, in this experiment users reported their vote to their social community. Therefore, clicking the "I Voted" button might best be seen as an act of political self-expression, since it is likely to be affected in part by the extent to which a user desires to be seen as a voter by others.

Strength of Measurement Strategy

Table 3.3 reports the key proportions of our mediating and dependent variables. All results in the paper focus on user behavior as a proportion of all users in the full matched sample, but the incidence of the behaviors increases when focusing just on users who are generally engaged with the site.

We note two important points for the validity of our measurement, which increase our confidence that our coding procedures are an appropriate

measurement strategy for our data. First, both our political coding algorithm and the LIWC emotional coding are well suited to characterize online political communication: the political algorithm was trained on tweets which are very similar in length and tone to status messages and the LIWC dictionary has been optimized to include phrases frequently used in these forms of short communication, such as "ugh", "hah", "lol" ("laughing out loud"), and "rofl" ("rolling on floor laughing"). Second, there is little overlap between the words that were used to identify political posts and words that were used to identify emotional posts. As shown in Tables 3.12, 3.13, 3.14, and 3.15, very few words which are highly predictive of political speech are part of the LIWC dictionary: only 8% of the top decile of politically predictive words and 12% of the second decile of politically predictive words are considered emotional.⁷ Thus, status messages that are coded as emotional and political are almost exclusively the result of the presence of *combinations* of words, not the presence of a single word in a post that is both strongly predictive of being political and considered to be emotional.

We note that while clicking the "I Voted" button as an act of political self-expression is important in its own right, it does not necessarily guarantee that a particular user actually voted. In a separate study utilizing an analogous measure from the 2010 congressional election, we validate the self-report measure with official election records from 13 states (see Bond et al. (2011)). A comparison between self-reported voting and validated vote in that data showed that the correlation between the two measures is strong and significant (Pearson's $r = 0.46$, SE 0.03, $p < 0.01$). Furthermore, there was significantly more under-reporting of voting than there was over-reporting of voting.

⁷As an additional validity check, we coded a subsample of the status messages (approximately 10%) for six co-occurring words in the two dictionaries that we thought could be potentially problematic: freedom, supreme, terrorism, terrorist, party and parties. We found that four of these words appeared in less than 0.5% of all status messages. The word "party" appeared in only 1.25% of all political posts and the word "freedom" appeared in only 1.15% of all political posts. It is unlikely that the magnitude of the emotional results presented in this paper are being driven by any systematic misclassification of certain kinds of posts of "emotional" when they are not.

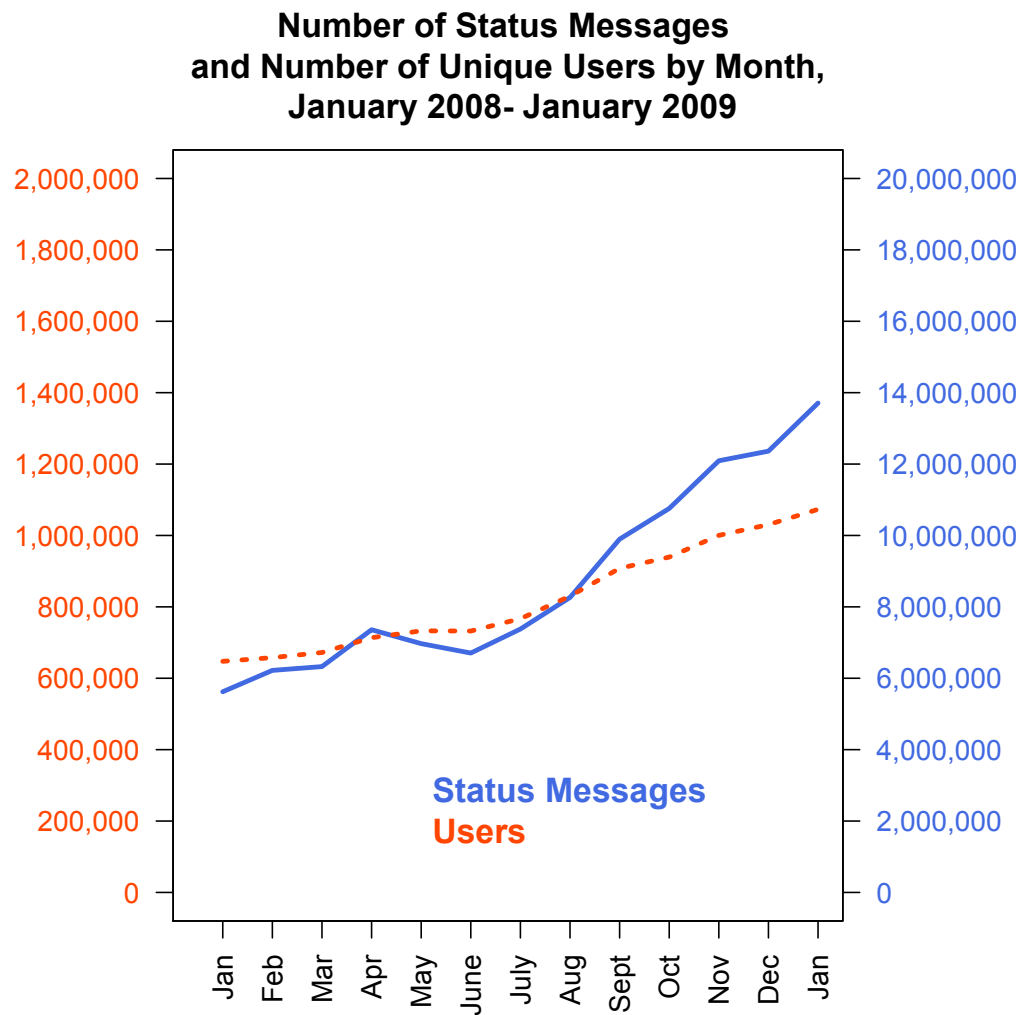


Figure 3.2: The number of status messages and number of unique users by month, January 2008-January 2009, showing the growth of Facebook status messaging over time.

Table 3.1: Table showing the weighted means of covariates in the matched sample. The top panel shows the weighted means of the complete matched sample, including those users who did not post any status messages. The lower panel shows the weighted means of users who post at least one status message between January 1, 2008 and January 31, 2009. "SM" signifies "status message;" the reported proportion in the last row of each table shows the proportion of users in the sample who posted at least one status message before the campaign season began.

	Battleground	Blackout	Difference
Age	28.431	28.431	0.000
Male	0.453	0.453	0.000
College	0.516	0.516	0.000
Photo Friends	82.812	83.903	-1.091
Photo Friends (Vigintile)	3.193	3.173	0.020
Friends	164.171	163.821	0.350
Friends (Vigintile)	5.607	5.607	0.000
SM Count	28.780	28.858	-0.078
SM Count (Vigintile)	3.180	3.180	0.000
Prop Posting At Least One SM	0.619	0.600	0.019
N	952,923	949,124	
	Battleground	Blackout	Difference
Age	26.760	26.787	-0.028
Male	0.439	0.439	0.000
College	0.540	0.540	0.000
Photo Friends	103.110	104.470	-1.360
Friends	196.027	195.624	0.403
SM Count	80.997	80.352	0.645
SM Count (Preseason)	37.722	37.859	-0.138
SM Count (Campaign)	18.746	18.222	0.524
Prop Posting At Least One SM	0.812	0.799	0.013
N	726,590	713,190	

Table 3.2: Counts and proportions of non-political and political messages, by emotional type. The last row reports the proportion of *users* who post an emotional status message. "Political users" are those users who post at least one political status message in the study period. Reported p-values are from a difference in proportions test with 95% confidence intervals, testing the difference in each category of emotionality between non-political and political messages.

	Count	Prop.	p-value
Non-Political Messages	112,526,638		
Emotional Non-Political Messages	39,837,053	0.354	0.000
Positive (only)	27,127,880	0.241	0.000
Negative (only)	15,910,585	0.141	0.021
Positive & Negative	3,201,412	0.028	0.000
Angry	6,738,456	0.060	0.000
Anxious	2,870,669	0.026	0.000
Proportion who Users who Post an Emotional SM	1,276,227	0.887	0.000
Political Messages	1,133,791		
Emotional Political Messages	340,589	0.300	
Positive (only)	219,030	0.193	
Negative (only)	161,169	0.142	
Positive & Negative	39,610	0.035	
Angry	95,098	0.084	
Anxious	35,464	0.031	
Proportion of Political Users who Post an Emotional SM	181,696	0.469	

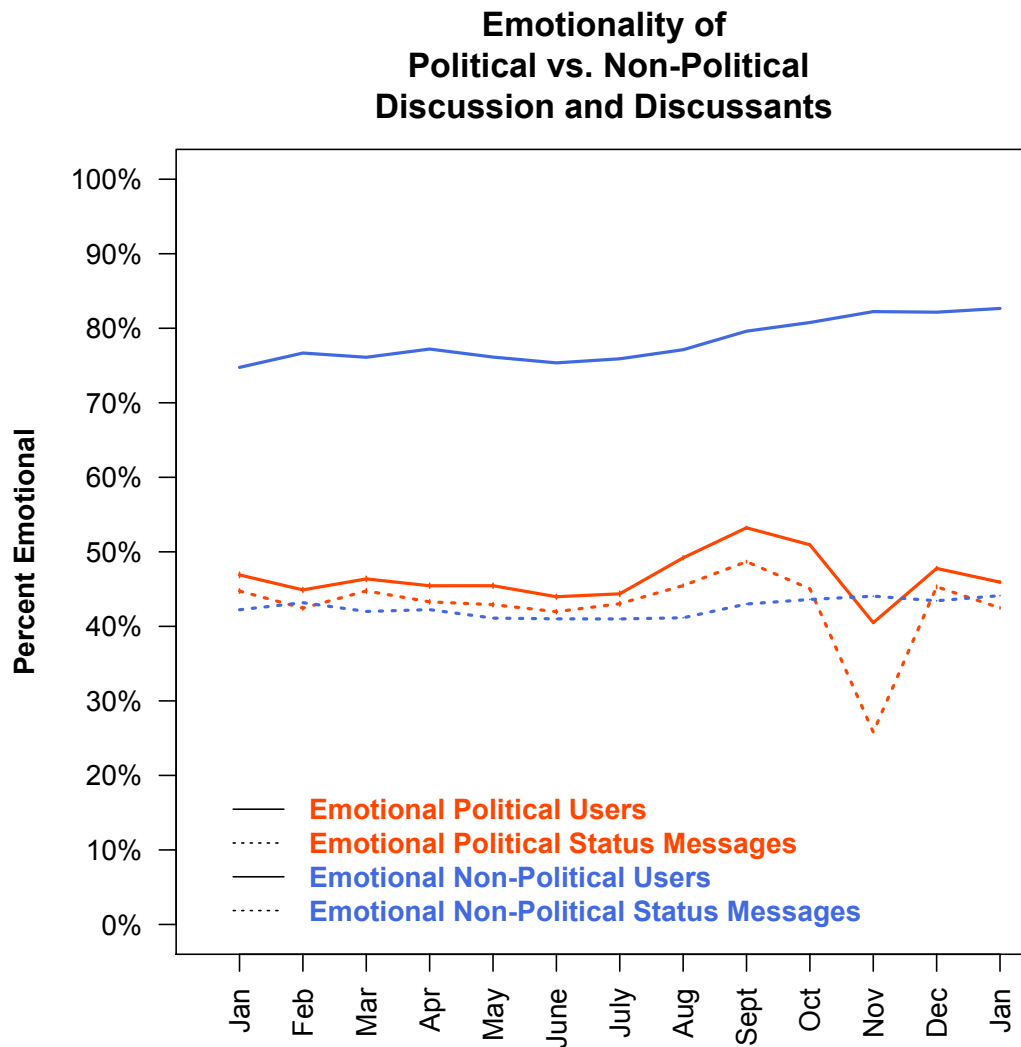


Figure 3.3: The percent of political and non-political users and status messages that are emotional, by month. Point estimates for each month between January 1, 2008 and January 31, 2009 are plotted with standard error bars. The emotionality of political discussion and discussants increases in the campaign season, while that of non-political discussion and discussants stays flat.

Table 3.3: A summary of the prevalence of mediator variables (political speech and emotional political speech) and the dependent variable (clicking the "I Voted" button). All results presented in this paper look at user behavior as a proportion of all users in the sample (row 1). However, the prevalence of status message posting and clicking "I Voted" is higher when looking only at users who posted a status message in the study period (row 2) , users who posted a status message in the campaign season (row 3), users who posted a political status message in the campaign season (row 4), or users who logged in on Election Day (row 5).

Denominator	Count	Political Status Posters	Emo. Pol. Status Posters	Vote Clickers
All Users	1,902,055	10.44% (10.42, 10.47) (198,660)	4.71% (4.70, 4.73) (89,612)	17.28% (17.26, 17.31) (328,745)
All Active Users	1,439,787	13.80% (13.77, 13.83) (198,660)	6.22% (6.20, 6.24) (89,612)	
All Users Active During the Campaign	1,102,554	18.02% (17.98, 18.06) (198,660)	8.13% (8.10, 8.15) (89,612)	
All Political Users Active During Campaign	198,660		45.11% (45.00, 45.22) (89,612)	
Users Logged in on Election Day	938,667			35.02% (34.97, 35.08) (328,745)

Results

The exact matching procedure resulted in a sample that has perfect balance on selected covariates when the generated weights are incorporated into mean or proportion calculations. This allows us to use weighted means or proportions tests to detect differences between users in the battleground and blackout states without relying on parametric regression techniques to control for potential confounding variables. Although "battleground status" was not randomly assigned to users, there should be no remaining differences between our treatment groups on the characteristics that could potentially confound the relationship between the treatment and the dependent variables. The study period is divided into five meaningful time periods: from the beginning of the year to the day after Barack Obama secured the Democratic Party nomination; the summer months before the party conventions; between the party conventions and the day before the election; the day of the election; and the period after the election through January 31, 2009.

Effects of Competition on Voter Turnout

First, it is interesting to note that about 1% more users in the battleground logged in on Election Day compared to users in the blackout. It is possible that exposure to campaign influence in the battleground made people more likely to get online and log in to Facebook.

Figure 3.4 shows that users living in battleground states are about 1.4% more likely to have clicked the "I Voted" button. In the language of Baron and Kenny (1986), this is the "total" effect of political competition on voting. Given a significant main effect of competition, we can proceed to examine the potential mediating role of engagement with politics before Election Day.

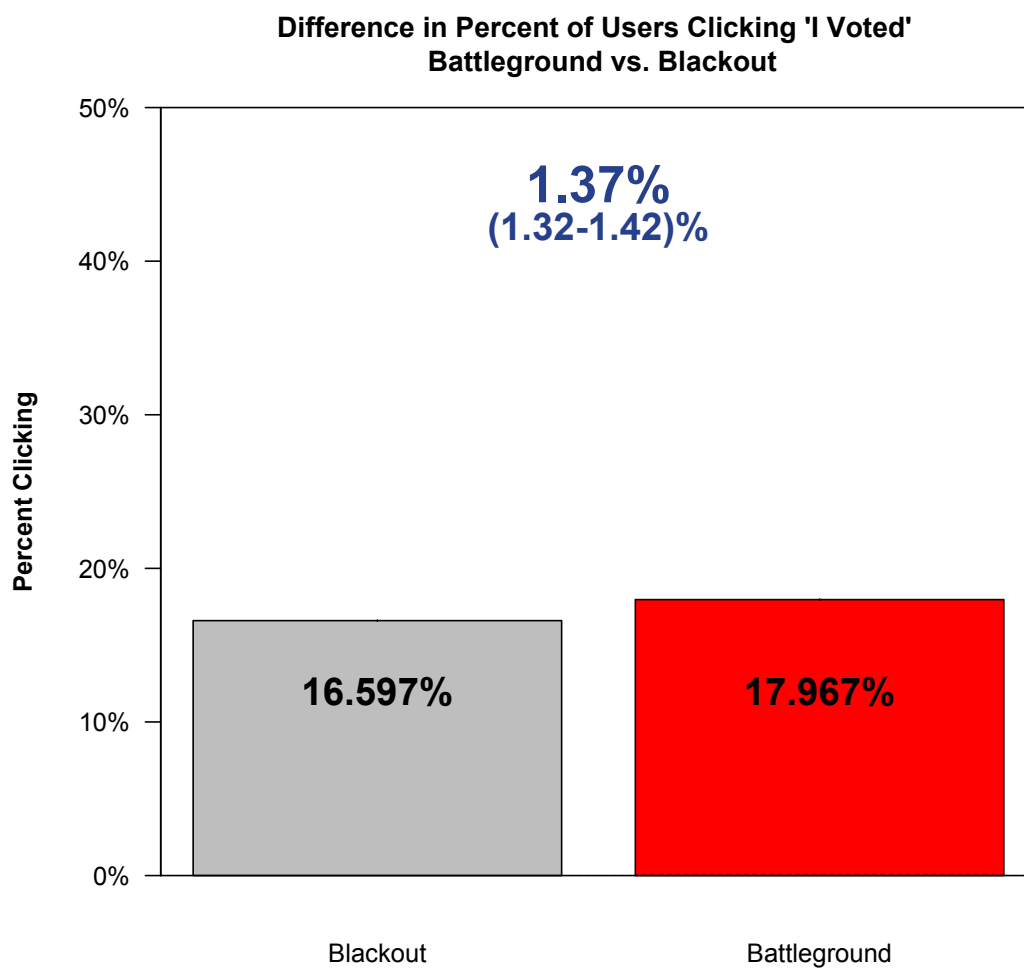


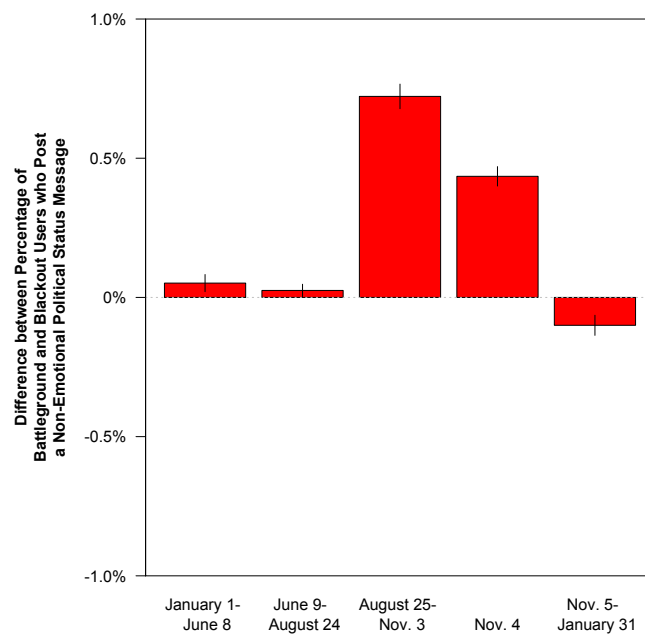
Figure 3.4: The effect of battleground status on the percentage of people clicking the "I Voted" button, out of all users in the matched sample (including those who did not log in on Election Day).

Effects of Competition on Engagement during Campaign Season

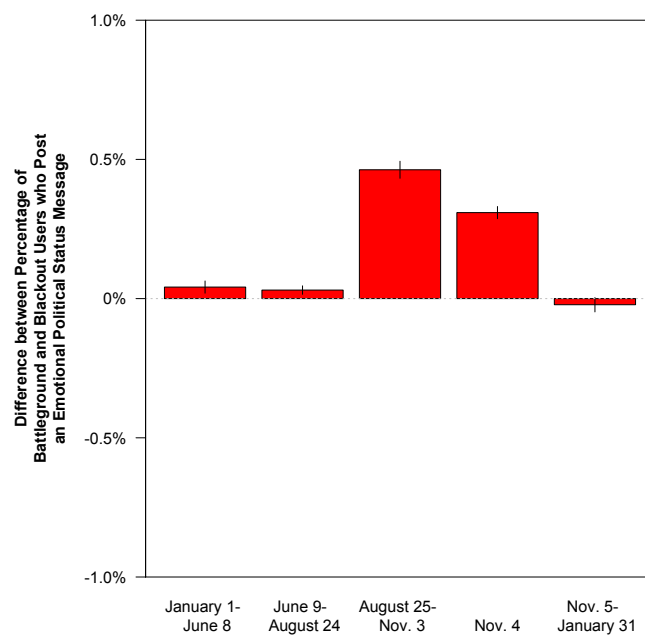
We next proceed to look at whether, during the campaign season, users in the battleground states are more likely to talk about politics, and to do so in an emotional manner. Approximately 0.72% more users in the battleground states make a non-emotional political status message during the campaign season, and approximately 0.47% more users in the battleground post an emotional political status message. These results are plotted graphically in Figure 3.5 and shown numerically in Figure 3.4. Although the magnitude of the increase in the percent of users who post political messages in the battleground may seem small, this represents approximately a 7% increase over baseline levels of non-emotional political posters and a 10.5% increase over baseline levels of emotional political posters in the blackout states.

Table 3.4: Percents are measured as the number of unique users who posted one or more (emotional) political status messages divided by the number of unique users in either the battleground or the blackout. The study period is divided into five meaningful time periods: from the beginning of the year to the day after Barack Obama secured the Democratic Party nomination; the summer months before the party conventions; the campaign season between the party conventions and Election Day; Election Day; and the period after the election through January 31, 2009.

	Battleground	Blackout	p-value
Non-Emotional Speech			
Primary Season	4.80 (4.78, 4.82)	4.75 (4.73, 4.77)	0.10
Summer	2.44 (2.42, 2.46)	2.41 (2.40, 2.43)	0.26
Campaign Season	10.81 (10.78, 10.84)	10.08 (10.05, 10.11)	0.00
Election Day	6.43 (6.40, 6.45)	5.99 (5.97, 6.02)	0.00
Post Election	6.64 (6.62, 6.67)	6.74 (6.72, 6.77)	0.01
Emotional Speech			
Primary Season	2.37 (2.35, 2.38)	2.32 (2.31, 2.34)	0.06
Summer	1.14 (1.13, 1.15)	1.11 (1.10, 1.12)	0.05
Campaign Season	4.94 (4.92, 4.96)	4.48 (4.46, 4.50)	0.00
Election Day	2.50 (2.20, 2.52)	2.20 (2.18, 2.21)	0.00
Post Election	3.28 (3.26, 3.30)	3.30 (3.28, 3.32)	0.40



(a) Non-Emotional Political Speech



(b) Emotional Political Speech

Figure 3.5: Battleground effect on status message posting

Effects of Engagement during the Campaign Season on Voting

Survey and experimental research suggests quite strong correlations between reported engagement with politics—emotional and cognitive—and the decision to vote. We find a similarly strong relationship. People who are more engaged with politics are more likely to have clicked the "I Voted" button (Figure 3.6). While there is a slight effect from each additional posted message, this effect appears to taper off quite quickly.

However, users who post emotional and non-emotional political status messages are very likely different in several important ways from users who are not likely to post emotional and non-emotional political status messages. It could be that these other attributes are driving their increased propensity to click the "I Voted" button, instead of a propensity toward political engagement itself.

Therefore, we conducted two additional matching processes, one to isolate the effect of emotional political status message posting on voting, and one to isolate the effect of non-emotional political status message posting on voting. In each process, we match users who post an [emotional] political status message between August 25th and November 3rd to people who do not post an [emotional] political status message, but who look just like them based on age, gender, education, battleground status, the number of status messages they post before August 25th (vintile), the number of friends they have (vintile), and whether they post an [emotional] non-political status message in the summer. This isolates the effect of engagement on voting, controlling for the treatment status of the respondent.⁸ Posting a non-emotional political status message increases the probability of clicking the "I Voted" button by 37.46%, while posting an emotional political status message increases the probability by 32.28%. These effects are of large magnitude, especially when considered

⁸A more rigorous set of matching criteria—including the number of political posts made in the primary season, the number of political posts made in the summer, and the number of emotional political posts made in the summer—produce substantively similar results, but checks of the sample composition show that the matching process excludes the most engaged users.

against the baseline level of voting among those who do not post messages.

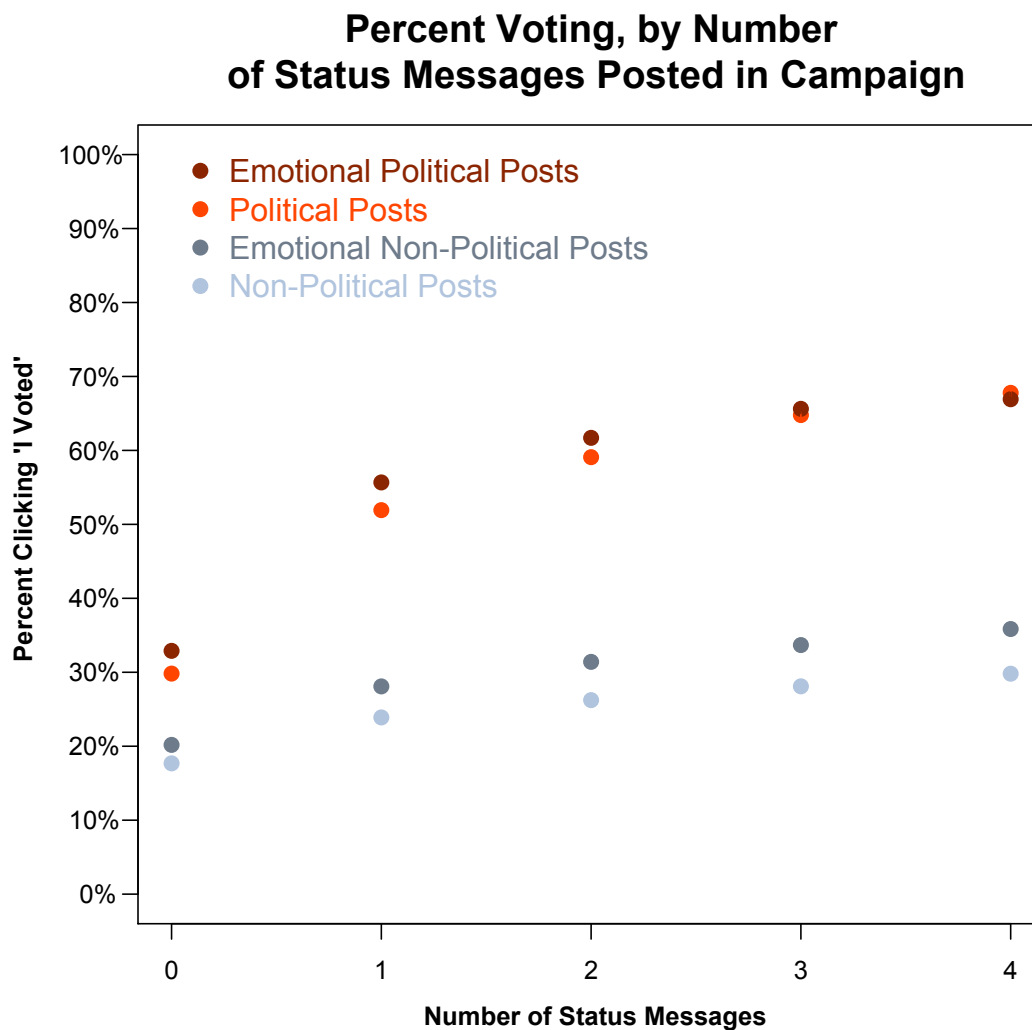
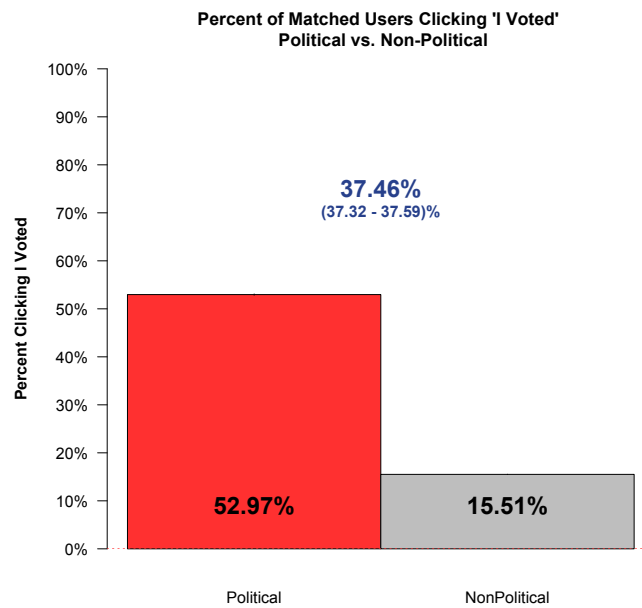
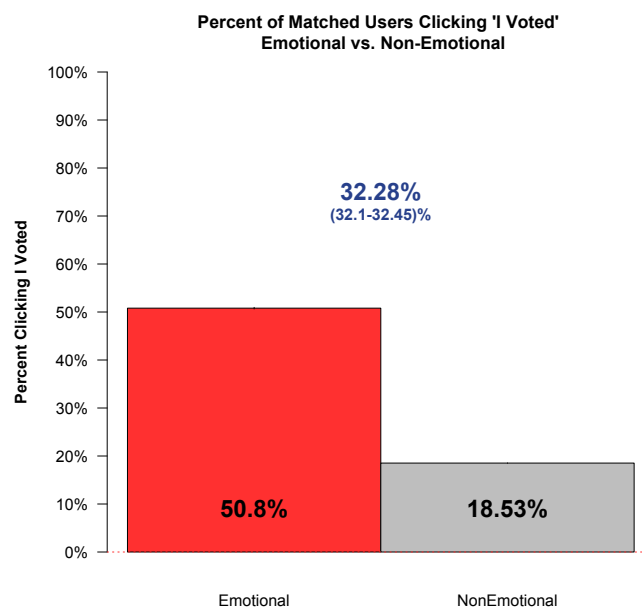


Figure 3.6: The effect of message posting on clicking the "I Voted" button. A greater proportion of users who post an emotional status message in the campaign season report voting, compared to users who post a political but not emotional status message, users who post an emotional but not political message, or users who post a non-emotional, non-political message. Points show the percent of users who clicked the "I Voted" button based on the number of messages they posted of various types. For example, about 30% of users who did not post any political posts clicked on the "I Voted" button, compared to only about 18% of users who did not post any status messages at all.



(a) Non-Emotional Political Speech



(b) Emotional Political Speech

Figure 3.7: The effect of status message posting on voting

Estimated Effects of Mediation

Figure 3.8 summarizes the main effects needed to calculate the mediation model. The total effect of competition on self-reported voting was found to be 1.37%, and to calculate the proportion of the total effect that is mediated through cognitive and emotional status message posting, we calculate $a*b/c$. Implementing this calculation, we find a mediating effect of non-emotional speech of approximately 19.74% and a mediating effect of emotional speech of approximately 10.91%. Combined, these two forms of engagement during the campaign season explain approximately one-third of the total effect of competition on voting (30.65%).

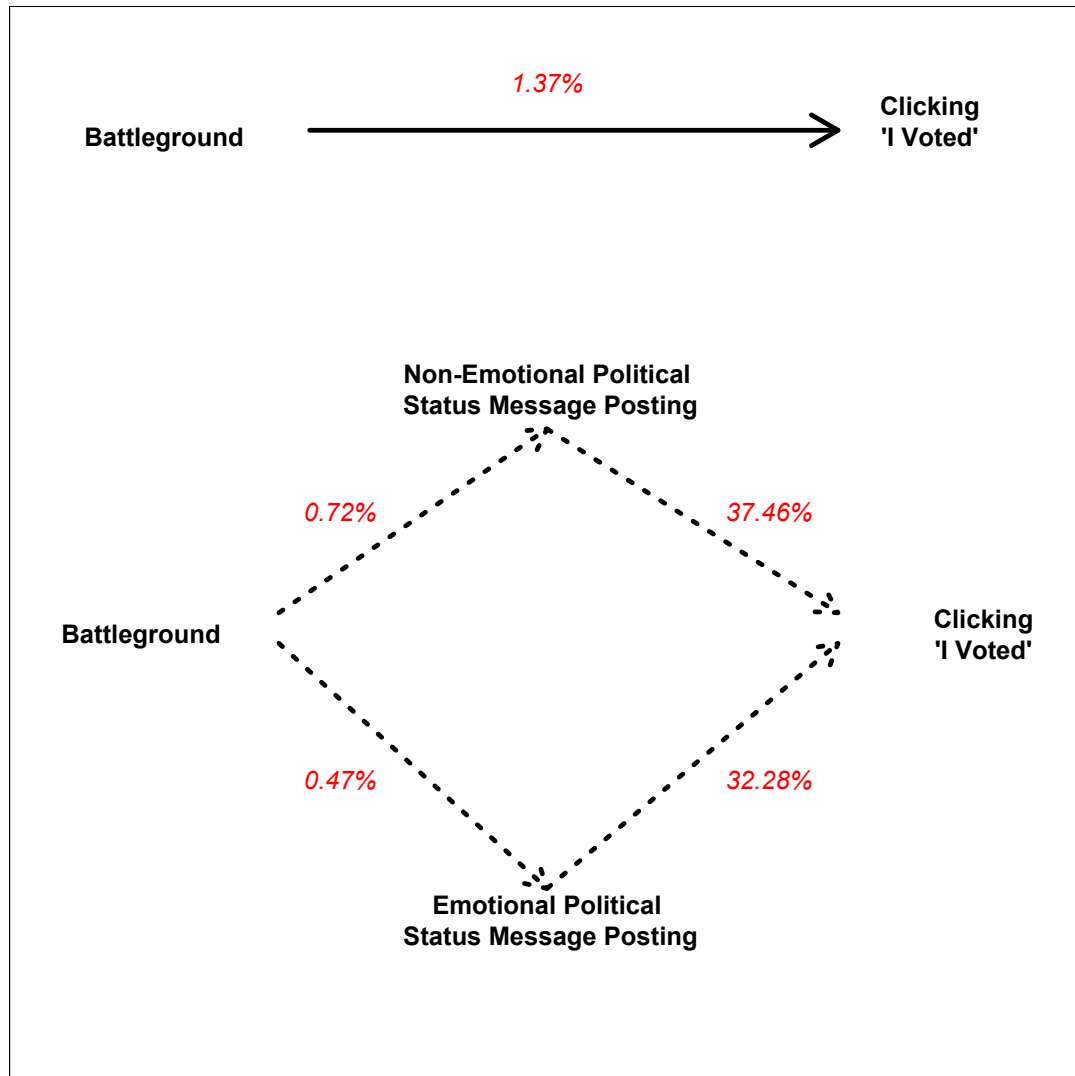


Figure 3.8: Summary of results in the mediation framework.

Discussion

Exposure to increased political competition alters the way that people engage with politics during the campaign season. Residents of battleground states talk about politics more frequently, and with more emotion, than do residents of states where the presidential campaigns are relatively inactive. This pre-Election Day political engagement mediates a large portion of the relationship between exposure to competition and self-reported voting: users who become more political in their day-to-day lives are more likely to report voting. For many users, political discussion on Facebook is likely an "early" event in the chain of decisions to engage with politics. Increased engagement with politics on a daily basis precedes the effects of competition that have been studied before on the aggregate and individual levels, such as increased voter turnout, political interest, and political knowledge. Thus, while previous research has focused almost exclusively on the effects of competition on voter turnout or vote choice because of the data that has been more readily available to analyze, our study shows that competition works not only on the ultimate decision to vote, but also on the intermediary steps that heighten engagement with the political sphere. While our study focuses solely on behaviors that occur within the context of the Facebook site, at least two studies have shown meaningful behavioral change stemming from political activity on Facebook (Bond et al., 2011; Ryan, 2011).

Some scholars have expressed concern that the Electoral College system perpetuates unequal access to political information that has long-lasting implications for political attitudes and behavior in blackout states. Despite the differences in the frequency and quality of political talk during the campaign season, there are few differences, most of small magnitude, between users' political behavior in the battleground and blackout states outside the campaign period. Previous concern in the literature about the long-term negative consequences of living in states with little political competition on political participation may be overstated. Furthermore, political discussion is emotional throughout the whole year. There is an increase in the emotionality of dis-

cussion during the election season, but this is a bump from a relatively high baseline. The emotional nature of discussion is seemingly responsive to national and international events before, during, and after the election season. Previous studies have disproportionately focused on stimuli related to political campaigns; our results suggest that people may be emotionally responsive to many other types of potential stimuli.

More importantly, political discussion is likely to spread through the social network. If an increase in a user's rate of political posting increases the likelihood that his or her friends also post a political status message, the impact of the small difference in posting between battleground and blackout states could resonate to have much larger effects. Political competition encourages users to post political status messages; users' friends in turn are exposed to the political discussion of their friends, and may be more likely to post a political status message themselves, even if they are not directly exposed to the political competition itself. These effects may also be at work in the spread of emotion through the network. Literatures from psychology and political science suggest many attitudinal and behavioral consequences of activating emotion, such as effects on levels of political interest, political tolerance, and political engagement. Thus, when Facebook users encounter the emotional political discussion of their friends on the site, it may further prompt their own emotionality toward politics and all the consequences that may entail.

Conclusion

This chapter is one of the first efforts testing foundational theories about political behavior using large scale, unobtrusively collected data about people's daily engagement with politics. Incorporating the use of social media into our understanding of the dynamics of political behavior is very promising, and this chapter represents only the beginning of the possible lines of inquiry using this and other datasets. We can enrich our analysis by modeling which parts of the "battleground" experience are most influential in increasing political discus-

sion, for example by matching in data about political advertising expenditures, candidate visits, or noteworthy events during the campaign such as debates and scandals. We can also move beyond campaign effects to study how social networks influence political behavior.

It is important not to lose sight of the potential drawbacks of the approach and weaknesses in this particular study. First, the population under study here is not representative of the voting age population from the states which were selected for study. Users on Facebook are younger than the population as a whole and likely differ in other important ways, as well. However, today over 100 million Americans use Facebook, out of approximately 230 million Americans over the age of 18. Facebook, while not used universally, is certainly ubiquitous, and a wider swath of the population is engaging with the site every month. Second, the mediator variable under study—status message posting—is a behavior which has only existed for approximately five years. It is a form of political engagement, but classifying its meaning beyond that is something that has been essentially unexplored. Future studies could explore the relationship between status message posting and more traditional forms of engagement; in addition to the relationship with self-reported voting on the Facebook site, we anticipate that there will be positive correlations between the frequency of status message posting and other online and offline forms of political behavior. Finally, users have little reason to systematically misrepresent their opinions and statements about politics, and misclassification due to sarcasm or other challenges should add to the noise of our measure without biasing it. However, posting an emotional status message is a form of emotional expression, and may not be a perfect reflection of a person's actual emotional response. This may be most true for emotions classified as representing "anxiety," as the public display of anxiety may be quite different than the private and physiological experience of anxiety.

The unique aspects of this data—the unsolicited statements of users, the high temporal resolution of message posting, and the sheer number of observations—give us a highly accurate picture of when and how people are

engaged with politics. This approach, as part of the computational social science revolution, offers a new perspective in demonstrating the patterns of political behavior we have studied for decades. We should be open to the idea that these new sources of data can be used to test both established theories and also to generate hypotheses about changes in the way we interact with politics due to technological advancements in our daily lives.

The analysis presented in this chapter is currently being prepared for publication: Settle, Jaime, Robert Bond, Lorenzo Coviello, Christopher J. Fariss, James Fowler, Jason Jones, Adam Kramer, and Cameron Marlow, "Day-to-Day Political Engagement Partially Mediates the Effect of Competition on Voting." I was the primary researcher on this paper and was responsible for designing the research, analyzing the data, and writing the manuscript.

Appendix

The Appendix contains supplementary materials which provide more information about the data and the processes used to code status messages.

Characteristics of the Unmatched Sample

Table 3.5: Difference of means (t-tests) for key characteristics between users in battleground versus blackout states in the unmatched sample.

	Blackout	Battleground	p-value	t
Age	29.436	29.021	0.000	27.276
Male	0.455	0.454	0.406	0.831
College Degree	0.500	0.506	0.000	-8.098
Friends	150.383	160.809	0.000	-36.096
Photo Friends	74.449	80.742	0.000	-20.689
Status Message Count	26.303	28.278	0.000	-21.787

Table 3.6: Means of key covariates in the states selected for study. "Friends" is the number of other users to whom a user has indicated a friendship on the site. "Photo Friends" indicates the number of other users with whom a user has been tagged in a photo. "Status Count" is the number of status messages a user made between January 1, 2008 and August, 24, 2008. The last column reports the proportion of users in each states who post at least one status message between January 1, 2008 and August, 24, 2008.

	Age	College	Photo Friends	Friends	Status Count	Male	Prop. Making At Least 1 SM
CA	30.575	0.444	57.971	115.049	23.370	0.488	0.568
FL	30.945	0.474	64.994	130.495	24.949	0.443	0.571
IN	28.300	0.516	87.384	173.073	31.603	0.453	0.631
KY	28.438	0.533	80.324	174.671	34.579	0.443	0.623
LA	28.420	0.518	86.008	186.696	27.668	0.429	0.589
MA	29.006	0.501	96.418	177.824	23.285	0.467	0.611
MO	28.678	0.506	88.749	163.299	31.470	0.443	0.624
OH	28.242	0.526	82.277	169.127	26.710	0.454	0.602
OR	30.741	0.504	51.522	97.676	22.612	0.446	0.558
VA	28.938	0.509	80.307	168.053	26.659	0.477	0.612

Table 3.7: Key characteristics related to voter registration and turnout in the states selected for study.

State	ECV	VEP	Total Regis.	VEP Regis.	VEP Change over 2006	Voter Reg. deadline for general	VEP TO 2004	VEP TO 2008
Battleground States								
Florida	27	12,542,585	11,247,634	90.5	9.2	10/6/08	64.42	66.90
Indiana	11	4,636,209	4,513,615	97.4	5.1	10/6/08	54.79	59.30
Missouri	11	4,352,278	4,205,774	97.9	0.3	10/8/08	65.33	67.20
Ohio	20	8,557,033	8,291,239	97.1	4.0	10/6/08	66.78	66.60
Virginia	13	5,518,704	5,034,660	91.5	11.4	10/6/08	60.61	67.50
Blackout States								
California	55	22,153,555	17,304,091	78.7	4.5	10/20/08	58.78	61.20
Kentucky	8	3,156,184	2,906,809	92.1	4.0	10/6/08	58.73	57.90
Louisiana	9	3,206,903	2,945,618	93.3	0.8	10/6/08	61.05	61.10
Massachusetts	12	4,672,376	4,220,488	90.7	3.0	10/15/08	64.24	65.90
Oregon	7	2,709,299	2,153,914	79.9	0.6	10/14/08	72.01	67.50

Table 3.8: Information about the 2008 primary and caucus results in states selected for study.

Area	Dem. Primary Caucus	Rep. Primary Caucus	Primary Turnout	Dem. Primary Turnout	Rep. Primary Turnout	Dem. Primary Clinton	Dem. Primary Obama	Rep. Primary McCain	Rep. Primary Romney	Rep. Primary Huckabee
Battleground States										
Florida	1/29/08	1/29/08	34.00	42.30	50.96	49.77	32.93	36.00	31.03	13.47
Indiana	5/6/08	5/6/08	37.30			50.56	49.44	77.62	4.74	9.98
Missouri	2/5/08	2/5/08 3/15/08	33.00			47.90	49.32	32.95	29.27	31.53
Ohio	3/4/08	3/4/08	42.40			53.49	44.84	59.92	3.32	30.59
Virginia	2/12/08	2/12/08	26.90			35.47	63.66	50.04	3.68	40.67
Blackout States										
California	2/5/08	2/5/08	40.00	75.07	56.08	51.47	43.16	42.25	34.56	11.62
Kentucky	5/20/08	5/20/08	29.20	43.06	19.01	65.48	29.92	72.26	4.65	8.29
Louisiana	2/9/08	1/22/08 2/9/08	17.70	25.68	22.86	35.63	57.40	41.91	6.34	43.18
Massachusetts	2/5/08	2/5/08	38.2			56.01	40.64	40.91	51.12	3.82
Oregon	5/20/08	5/20/08	43.2	74.42	52.79	40.50	58.52	80.88	0.00	0.00

Table 3.9: Characteristics of the electoral campaign in the states selected for study.

Area	Obama Campaign Visit Count	McCain Campaign Visit Count	Donations	Obama Percent Percent 2008	Percent Registered Democrat 2004	Percent Registered Democrat 2008 (January 2008)
Battleground States						
Florida	15	13	\$53,243,671	51.42	41.37	40.55
Indiana	13	5	\$5,771,678	50.52		
Missouri	16	14	\$9,812,759	49.93		
Ohio	23	27	\$15,898,380	52.33		
Virginia	22	9	\$31,806,663	53.18		
Blackout States						
California	8	6	\$153,202,456	62.28	43.00	42.95
Kentucky	0	3	\$4,598,892	41.77	57.81	57.04
Louisiana	0	0	\$5,467,781	40.54	55.36	52.70
Massachusetts	2	1	\$36,711,708	63.20	37.25	
Oregon	0	0	\$7,827,913	58.41	38.72	42.90

Key Tables and Figures for Political Coding

A full explanation of the approach to coding political status messages is provided in Fariss et al. (2011). We used a machine-learning algorithm on Twitter data to develop a dictionary of politically predictive words. Table 3.10 shows the coefficients of the 25 most predictive words for predicting political posts and for predicting non-political posts. Table 3.11 gives examples of the text and predicted probabilities of a sample of Twitter posts.

The dictionary was then used to code the predicted probability that the status messages posted by users in our matched sample were political. Validity checks presented in Fariss et al. (2011) indicate that the process works well, and there is a high degree of face validity to the measure. Figure 3.9 shows the distribution of posts of various types made in the study period. Figure 3.10 shows the proportion of posts that are political for each day in the study period, using two different predicted probabilities as cutoff values for considering a post to be political. The remainder of the analysis will consider a post to be political if it scores 0.75 or higher on predicted probability measure. While this lower threshold increases the probability of detecting false positives, or posts that we categorize as political that are not "truly" political, this cutoff achieved excellent model fit in the test data. Using the lower threshold value, at some point during the study period, 20.38% of the overall sample made a political status message; 26.92% of the sample that posted any status message posted at least one political status message.

Table 3.10: Selected words from the political coding dictionary showing 25 words which are most predictive of political speech and 25 words which are most predictive of non-political speech. Words which are also part of the emotional coding dictionary are in bold. The reported difference in predicted probability is the change in predicted probability moving from a status message that does not contain the word compared to a status message with the word, if no other words from the political coding dictionary were used in the status message.

Political Word	Difference in Predicted Probability	Non-Political Word	Difference in Predicted Probability
politic	0.793	museum	-0.175
political	0.793	pandemic	-0.172
politics	0.793	beautiful	-0.168
socialism	0.774	yay	-0.168
maddow	0.770	managers	-0.168
kennedy	0.765	manager	-0.168
assemble	0.757	management	-0.168
assemblies	0.757	microsoft	-0.167
assembly	0.757	downloads	-0.167
dobbs	0.739	downloading	-0.167
cheney	0.714	downloaded	-0.167
cheney's	0.714	download	-0.167
clunker	0.702	birthdays	-0.167
clunkers	0.702	birthday	-0.167
schwarzenegger	0.701	bonos	-0.167
clinton	0.690	bono	-0.167
clintons	0.690	software	-0.167
cabinet	0.687	chilling	-0.166
cabinets	0.687	chillin	-0.166
census	0.683	weathers	-0.165
obama	0.679	weathering	-0.165
obamas	0.679	weathered	-0.165
biden	0.679	weather	-0.165
bidens	0.679	tasty	-0.165
communist	0.672	pizza	-0.165

Table 3.11: A sample of processed Twitter messages and the predicted probability that they are political. Text was processed to remove all capital letters and punctuation.

Pr()	Message
99.87%	worth a look new gallup poll finds conservatives are single largest ideological group in us
99.67%	i think its funny conservatives call obama socialist for bailing out auto financial industries
98.05%	big health mounts a fullon assault against obamas plan
96.85%	study finds serial killers and politicians share many traits
91.94%	democrats owe their majority to moderates
91.70%	we are a nation of laws and people not policies and politicians
91.33%	rep mike pence is exposed as an out of touch conservative on fox news sunday
87.81%	sen frank luntz exposed rebuked over care reform from senate floor
84.84%	house health care proposal adds billion in taxes
80.12%	obama officials outline financial reforms
76.19%	health care debate could derail over govt plan
75.47%	gov sanford says limbaugh cheney need to defer and allow some new voices to be heard
71.84%	what will she do lick the intruder to death or just run over them
65.87%	if federal government involved in creation god would still be waiting on environmental impact statement
63.47%	being progressive is hard this may take a while to get used to
61.77%	researching cultural statistics on stress just reading some of this stresses me out
51.97%	this chair sucks
50.05%	lets move to miami miami unanimously adopts domestic partnership ordinance
48.66%	just woke up had a successful drinking night woot lets do it again
43.96%	i just published another article
42.79%	this man took a polaroid every day for years until the day he died fascinating tragic very human
39.37%	super funny top ten messages on sarah palins answering machine
38.24%	cooking breakfast eggs and sausage patties yummmmy
36.76%	just went to a baby shower thankful to the lord above that i am not pregnant right now
28.05%	dont take it as an insult i just thought it was funny
23.23%	is becoming a cleaning lady
22.33%	watching the news
18.68%	is the money worth the reputation
18.46%	when you catch fire you never remember the stop drop and roll rule
10.05%	court goes further spelling out deportation rules
6.93%	its one of those hold your head in your hand moments ha ha
2.95%	so tempted to lay on my desk and sleep but that wouldnt be professional would it
2.16%	im not feeling well
1.33%	finally it has stopped raining time for some hiking and fishing
1.03%	is it sad that the only thing i miss about idaho is the really great mexican food

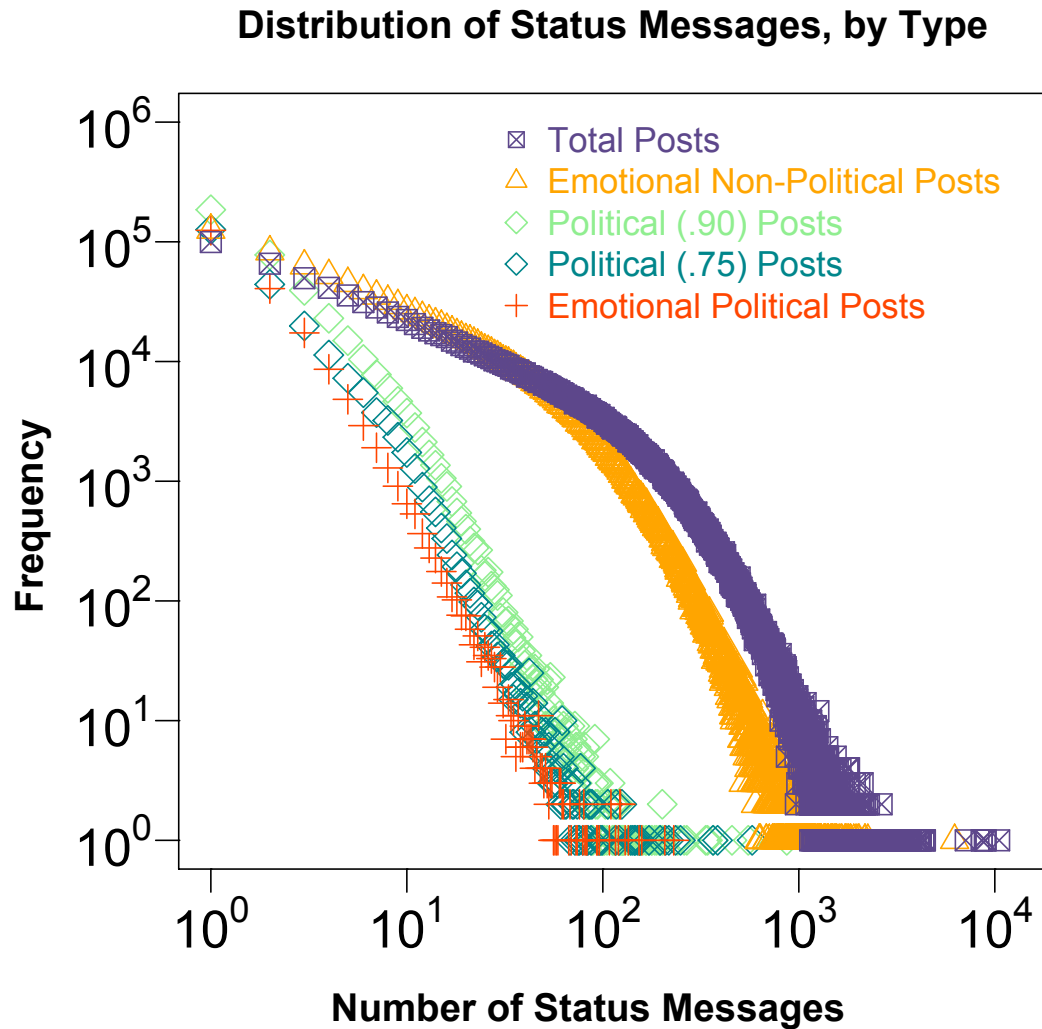


Figure 3.9: Distribution of Facebook status messages of various types. Two different cutoff values are used to define whether a post is political: a 75% probability that a post is political and a 90% probability that the post is political. Emotional political posts are those that score higher than 0.75 on the predicted probability measure and use one or more words from the LIWC positive or negative emotion coding dictionaries

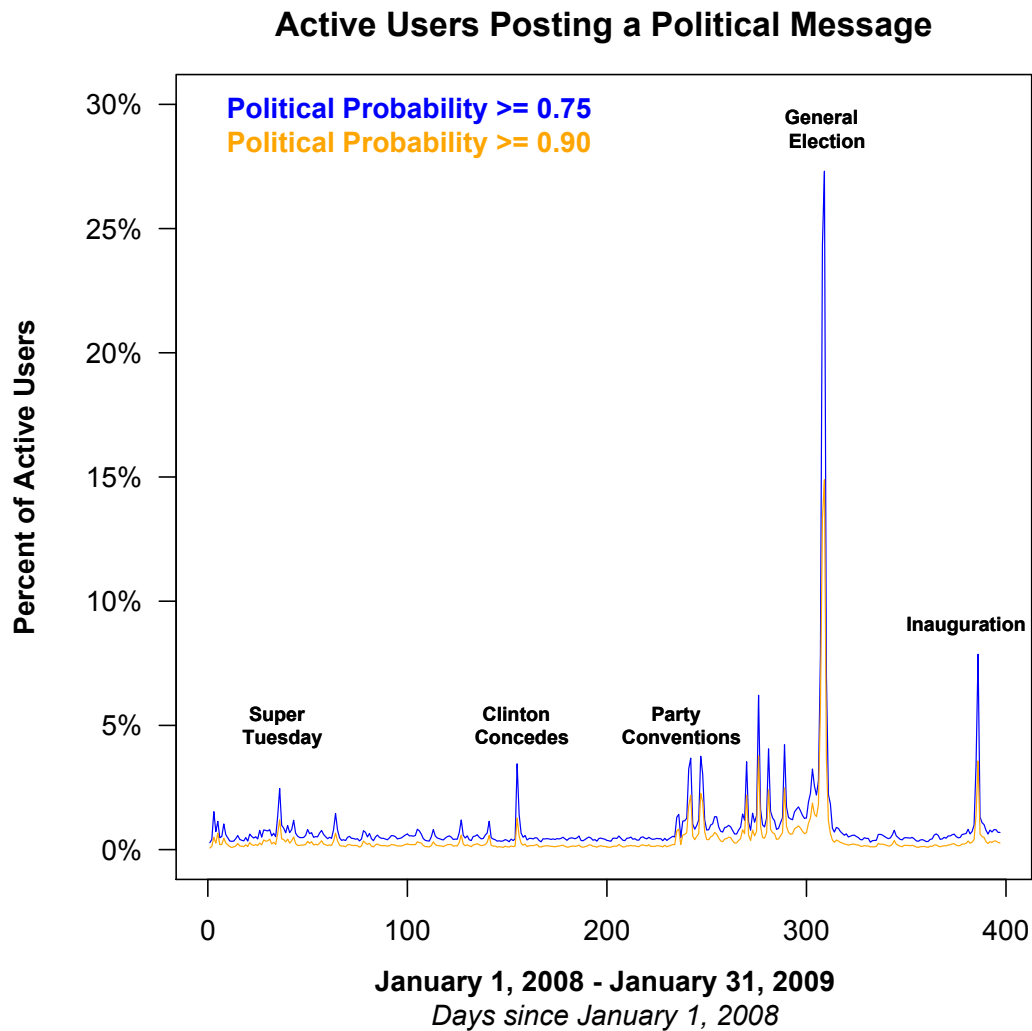


Figure 3.10: The percent of users who post a political message each day, out of all users who post a message that day. Two different cutoff values are used to define whether a post is political: a 75% probability that a post is political and a 90% probability that the post is political. Peaks correspond to major political events, such as Super Tuesday, the day Barack Obama secured the Democratic nomination, the general election, and the inauguration.

Key Tables and Figures for LIWC Emotional Coding

Table 3.12: Emotionality of words in the political coding dictionary. The reported difference in predicted probability is the mean change in the decile in the predicted probability of being political, moving from a status message that does not contain the word compared to a status message with the word, if no other words from the political coding dictionary were used in the status message. Thus, the appearance of one of these words does not strictly determine whether a status message is political; it simply increases or decreases the probability of the message being labeled as political.

Political Decile	Emotional/ Total Words (%)	Change in Probability
1	18/102 (18%)	-0.15
2	21/106 (20%)	-0.12
3	16/104 (15%)	-0.10
4	19/104 (18%)	-0.07
5	6/103 (6 %)	-0.03
6	11/105 (10%)	0.03
7	12/104 (12%)	0.11
8	12/103 (12%)	0.22
9	13/105 (12%)	0.36
10	8/105 (8%)	0.48

Table 3.13: 25 most predictive words of non-political speech, of all words jointly appearing in both the LIWC dictionary and the political coding dictionary. The reported difference in predicted probability is the change in predicted probability moving from a status message that does not contain the word compared to a status message with the word, if no other words from the political coding dictionary were used in the status message. Thus, the appearance of one of these words does not strictly determine a status message to be political; it simply increases the probability of the message being labeled as political.

LIWC Word or Stem	LIWC Category	Difference in Predicted Probability	Words in Political Coding Dictionary
plays	positive	-0.113	plays
wow	positive	-0.114	wow
thanks	positive	-0.114	thanks
favor	positive	-0.116	favorite, favorites
enjoy	positive	-0.118	enjoy, enjoyed, enjoying, enjoys
excit	positive	-0.120	excite, excited, excitement, exciting
festiv	positive	-0.123	festival, festivals
love	positive	-0.126	love
loved	positive	-0.126	loved
loves	positive	-0.126	loves
loving	positive	-0.126	loving
sorry	negative	-0.129	sorry
luck	positive	-0.136	luck
lucky	positive	-0.136	lucky
cool	positive	-0.139	cool
pretty	positive	-0.140	pretty
haha	positive	-0.144	haha, hahaha
lol	positive	-0.145	lol
rofl	positive	-0.145	rofl
cute	positive	-0.145	cute
bore	negative	-0.159	bore, bored, bores
boring	negative	-0.159	boring
lmao	positive	-0.164	lmao
yay	positive	-0.168	yay
beaut	positive	-0.168	beautiful

Table 3.14: 20 most predictive words of political speech, of all words jointly appearing in both the LIWC dictionary and the political coding dictionary. The reported difference in predicted probability is the change in predicted probability moving from a status message that does not contain the word compared to a status message with the word, if no other words from the political coding dictionary were used in the status message.

LIWC Word or Stem	LIWC Category	Difference in Predicted Probability	Words in Political Coding Dictionary
protest	negative_anger	0.650	protest
critici	negative_anger	0.587	criticism, criticisms, criticize, criticized, criticizing
freed	positive	0.555	freedom, freedoms
fight	negative_anger	0.468	fight, fighting, fighter
fought	negative_anger	0.468	fought
tortur	negative_anger	0.439	torture
peace	positive	0.396	peace
truth	positive	0.341	truth
rape	negative_anger	0.299	rape, raped, rapes
rapist	negative_anger	0.299	rapist
care	positive	0.278	care
cares	positive	0.278	cares
defens	negative_anger	0.258	defense
terror	negative_anxiety	0.238	terror, terrorism, terrorist
suprem	positive	0.236	supreme
secur	positive	0.223	security
partie	positive	0.221	parties
party	positive	0.221	party
suck	negative_anger	0.208	suck
sucker	negative_anger	0.208	sucker

Table 3.15: Table shows selected deciles of words in the political index. Words which appear in both the political and emotional dictionaries are shown in bold. Full dictionary available upon request from the author.

Political Decile	Words
1	beautiful , birthday, birthdays, bono, bonos, bore, bored, bores, boring , chillin, chilling, code, codes, computer, computers, cool , copies, copy, cute , cuz, design, designed, designing, designs, destination, destinations, digital, download, downloaded, downloading, downloads, dude, dudes, dvd, dvds, estate, estates, fight, fighter, fighting , flight, flights, golf, golfer, golfing, hah, haha, hahaha , ipod, ipods, kinda, lakers, level, listen, listened, listening, lmao , lmfaio, lol , lunch, lunches, magic, magics, management, manager, managers, market, microsoft, museum, myspace, nuevo, omfg, omg, pandemic, park, parks, pizza, pretty , rofl , screen, screens, series, shoe, shoes, shop, shopped, shopping, shops, software, tasty, totally, virtual, weather, weathered, weathering, weathers, wine, wines, yay , yea, yeah
9	abortion, abortions, ahmadinejad, analyses, analysis, analyze, belief, believe, believes, campaign, campaigned, campaigner, campaigning, campaigns, care, cares , certificate, certificates, climate, confirmation, confirmations, criminal, criminals, endorse, endorses, federal, feds, fight, fight, fighting , find, finding, finds, flights, foreign, fought , found, franken, fraud, fraudulent, government, governor, govt, headline, headlines, iam, illegal, illegals, insurance, insure, insured, insurers, israel, just, mayor, mccain, mccains, military, militarys, minister, ministers, myth, peace , pledge, policies, policy, poll, polled, polling, polls, pollster, prayer, prayers, probe, probes, progressive, progressives, rape, raped, rapes, rapist , reform, reformed, reforming, reforms, revolution, revolutionary, revolutions, russia, socialized, speech, speeches, torture , trial, trials, truth , unemployment, wash, washed, washes, washing, whitehouse, whitehouses, year, years
10	activism, activist, activists, afghan, afghanistan, assemble, assemblies, assembly, baucus, baucuss, beck, becks, biden, bidens, birth, births, bush, bushs, cabinet, cabinets, candidate, candidates, census, cheney, cheneys, clinton, clintons, clunker, clunkers, communist, communists, congress, congressional, conservative, conservatives, constitution, criticism, criticisms, criticize , criticized, criticizing , debate, debated, debates, debating, debator, democrat, democrats, dems, detain, detained, detaining, detains, dobbs, editorial, editorials, freedom, freedoms , gop, iran, kennedy, liberal, liberals, limbaugh, lobby, maddow, missile, msnbc, nobel, obama, obamas, oreilly, oreillys, palin, palins, politic, political, politics, protest , protests, pulse, queen, queens, racism, racist, racists, regime, regimes, republican, republicans, scandal, scandals, schwarzenegger, socialism, stalin, stewart, stimuli, stimulus, thread, threaded, threading, threads, urgent, wilson, wilsons

Emotional political discussion is remarkably dynamic: we see increases in negative emotion during the months of the campaign season and a general trend toward increased positive emotion toward the election. Emotional discussion of politics seems to be very responsive to political events (Figure 3.11, Figure 3.12 and Figure 3.13). Political status messages are decidedly more anxious in the period between the conventions and the election as compared to levels during the summer months, but they are not more angry than they were early in 2008. Although we do not know the particular content of each political status message, we do see peaks in the emotionality of political speech on days we would expect a response to political events. For example, we see peaks in positive emotionality on the days of the election and the inauguration; decreases in anger around the time of the political conventions; and peaks in anxiety in response to foreign policy events and economic troubles.

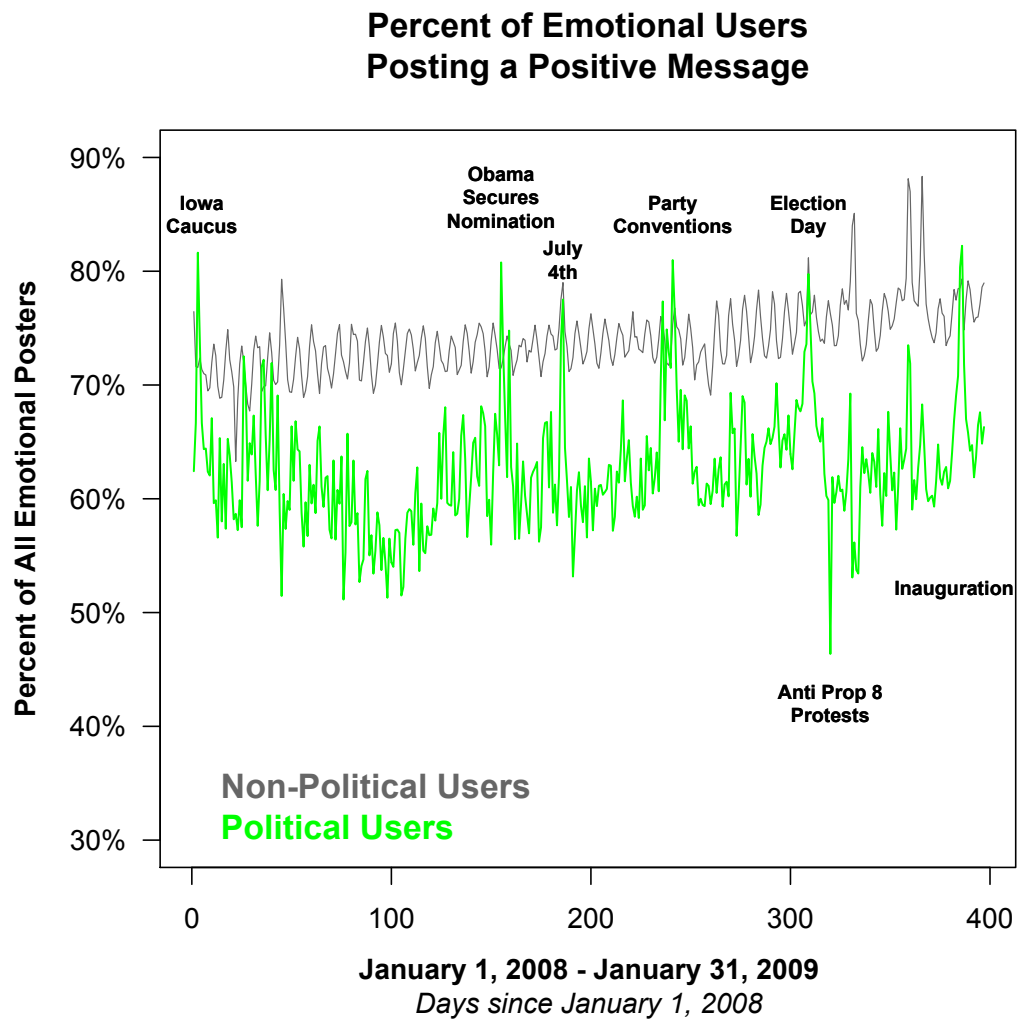


Figure 3.11: Positive emotional status message posting. The green line plots the percent of all emotional political users who make a positive political post. The gray line plots the percent of all emotional non-political users who make a positive post. Political users and non-political users seem to be responding positively to distinct events, and the weekly fluctuation in positive non-political status message posting is not visible in political status message posting.

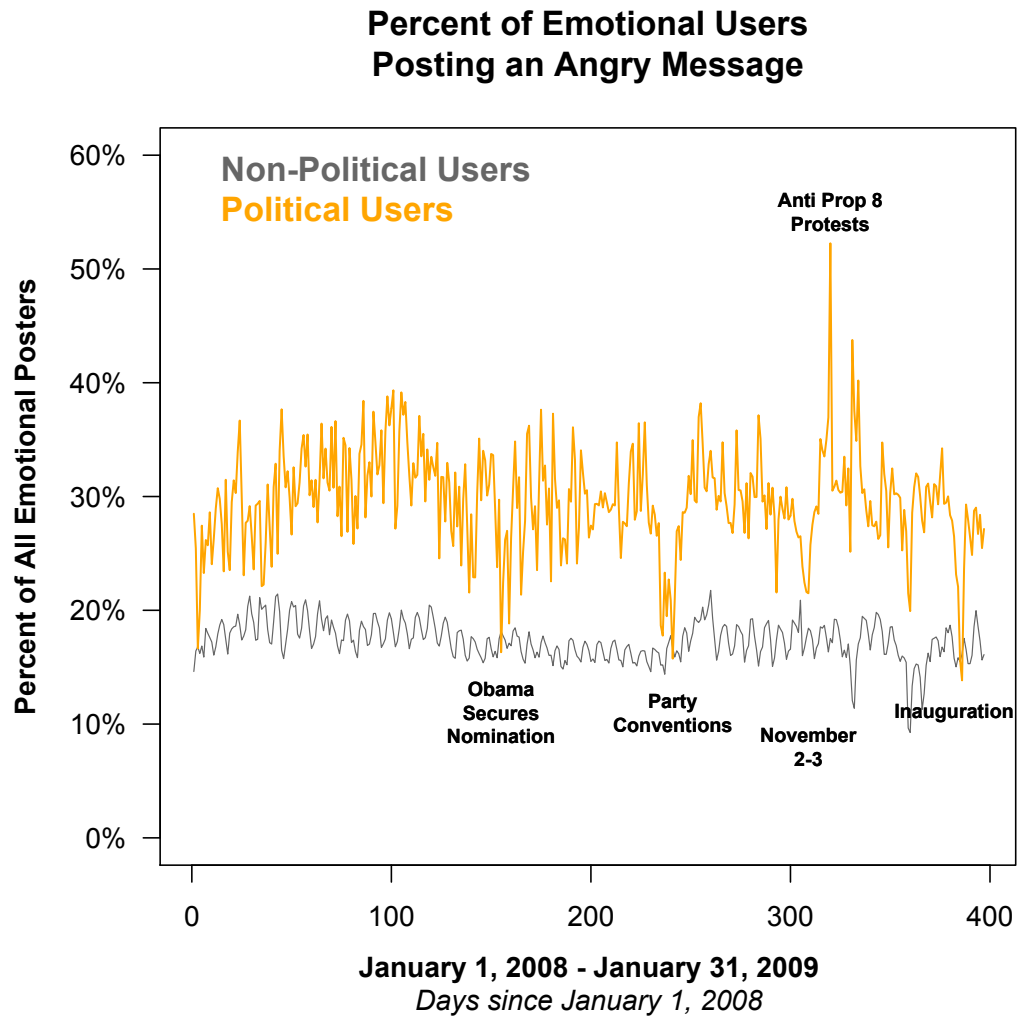


Figure 3.12: Angry status message posting. The orange line plots the percent of all emotional political users who make an angry political post. The gray line plots the percent of all emotional non-political users who make an angry post. More political users are angry, on average, than are non-political users. Political users and non-political users seem to be responding positively to distinct events, and the weekly fluctuation in positive non-political status message posting is not visible in political status message posting.

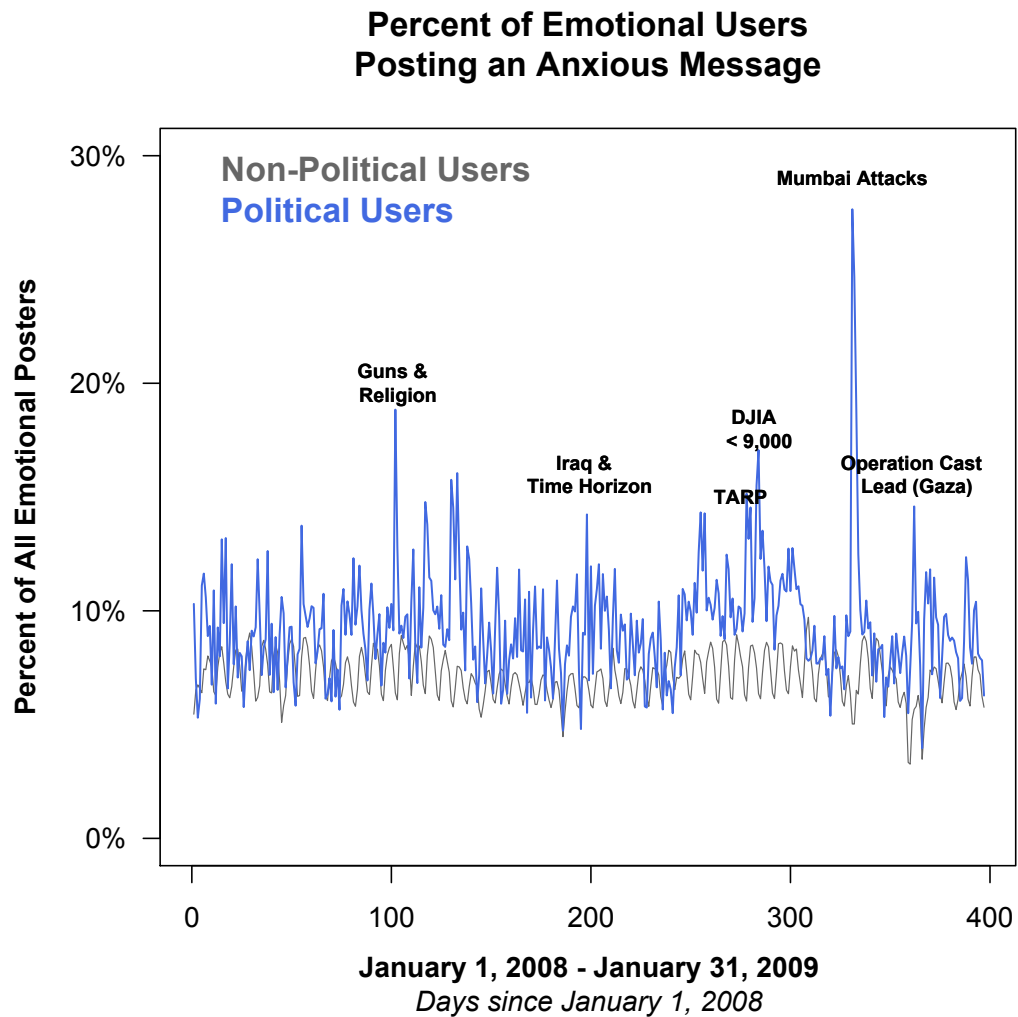


Figure 3.13: Anxious status message posting. The blue line plots the percent of all emotional political users who make an anxious political post. The gray line plots the percent of all emotional non-political users who make an anxious post. During the campaign season, a greater proportion of political users appear to be anxious as compared to users who do not post about politics.

Chapter 4

Political Contention and Stress Sensitivity Interact to Affect Voter Turnout

Introduction

Scholars of the political contextual environment have long been interested in the question of whether the distribution of partisans within a geographic context has an effect on the participation and preferences of its residents. As described in the first chapter of the dissertation, the pattern of empirical findings on this question creates a paradox: analysis of the aggregate behavior of an electorate in response to political contention does not always align with the proposed mechanisms of the effects of contention suggested by individual-level studies. We argue that we can gain more traction on understanding the paradox of the effect of political contention on individual voter behavior by considering how individual predispositions moderate the effect of this aspect of the political environment.

In this chapter, we leverage genetic heterogeneity between individuals to explore how the effects of the political environment are conditioned on individual differences. We study two distinct aspects of the political environ-

ment related to the idea of political contention. The first study on a sample of Californians focuses on the balance of registered partisans in a respondent's neighborhood, an idea we call "partisan heterogeneity." The second study on a nationally representative sample focuses on the idea of partisan imbalance, and explores the effects of being a "partisan minority" in one's county. Although these are conceptually distinct representations of the notion of political contention, we argue that both situations can constitute a politically threatening environment. We suggest that these environments have distinct effects on people who may be genetically predisposed to be less resilient to the perception of threat, and that living in a competitive neighborhood or being an outsider in one's community may discourage these people from participating in politics. To test this, we examine the interaction between the political environment and the 5HTT gene, which is thought to regulate response to social stress. For people with a certain variant of this gene, a politically contentious environment presents a threatening environment to which they may respond by disengaging politically and abstaining from voting.

We conduct these tests in two different datasets, both of which have the relatively unique property of combining genetically informative data, information about voter turnout, and information about the political context in which respondents live. We demonstrate that those who carry the short allele of 5HTT are less likely to vote, but only when confronted with a contentious political environment as measured either by living in a precinct where the two major political parties have approximately equal numbers of registered supporters, or living in a county where the respondent's political beliefs are out of step with the majority. These results suggest that studying the effect of the environment without considering the influence of personal predispositions may mischaracterize the mechanism by which the environment matters. In a larger sense, these results support the argument that those interested in understanding the role of political environments should look to differences between subjects, such as differences in important personality traits and their genetic correlates.

5HTT and Response to Threat

Previous studies offer theoretical reasons and empirical support for why we might expect political contention to affect voter turnout. What these studies have in common is that they have almost uniformly ignored the potential role of individual differences that structure response to threat. Studies have shown that genes play an important role in modulating one's sensitivity to stress events. Some individuals may therefore be more easily influenced by aspects of the political context due to innate predispositions. Accordingly, we look to genes that have been implicated in stress response and could likely be affected by political contention.

A prime candidate is 5-HTTLPR, a polymorphic region in the SLC6A4 gene that codes for a serotonin transporter. Serotonin is a chemical which is released in the brain when a presynaptic neuron fires. After a neuron fires, it is sensed by receptors on postsynaptic neurons, which uptake the serotonin. Sequential firing of neurons after each other carries signals throughout the body. In short, serotonin is centrally related to individual differences in social functioning. When individuals are confronted with stress—perhaps especially social stress—they are likely to flood the gaps between neurons with excess serotonin. If this serotonin is not taken up by postsynaptic neurons and broken down, it has the potential to oxidize and kill both presynaptic and postsynaptic neurons, further handicapping a cell's ability to handle stress.

The exact role of 5HTT in the regulation and management of stress remains to be elucidated. However, it is among the polymorphisms thought to be related to one's "central sensitivity to the pathogenic effects of the environment" (Kendler et al., 2005; Stein, Schork and Gelernter, 2007). Indeed, Stein, Schork and Gelernter (2007) hypothesize that this polymorphism is directly or indirectly related to some aspect of brain functioning "relevant for buffering stress," whether through a very complex mechanism or through something more quantifiable, such as the amount of serotonin available in the brain. One idea is that 5HTT matters by regulating the uptake of excess serotonin. The 5-HTTLPR polymorphism is in the promoter region of the gene and is central

in determining this reuptake of serotonin as it acts as a transporter of serotonin across cell walls. Those who have the more efficient allele are better able to re-uptake serotonin into a cell where it can then be broken down. Accordingly, those with this more efficient version of the gene are thought to be better able to cope with stressful social situations. The general consensus is that the "long" 528 base-pair allele is more transcriptionally-efficient than the 484 base-pair allele, and studies either compare those who are homozygous for the long allele compared to those who carry any version of the short allele, or compare the additive effect of each short allele.

Murphy and Lesch (2008) provide perhaps the most comprehensive review on the consequences of variants on 5HTT. Among humans, they note that, "The 5HTTLPR short variant ... is strongly associated with anxiety-related, harm avoidant, and negative personality traits in humans" (see also Kendler et al. (2005); Grabe et al. (2005); Jacobs et al. (2006); Kaufman et al. (2004, 2006); Sen, Burmeister and Ghosh (2004); Stein, Seedat and Gelernter (2006). Moreover, leveraging knock-out studies in mice, they catalogue a long list of correlates with short alleles. Biochemically, mice with short alleles have been found to have fewer SERT binding sites, lower rates of serotonin uptake and clearance, less serotonin content in the brain, and greater extracellular fluid serotonin and serotonin synthesis. Behaviorally, short alleles are associated with great anxiety, learned fear, learned helplessness, and startle response. It is likewise associated with reduced aggression and exploratory activity.

Taken together, these findings suggest that those with short versions of 5HTT should be more likely to select out of politics when confronted with stress, as they will be less able to successfully manage the contention of politics, arrive at a vote decision, and act on that decision. Accordingly, we empirically expect to see lower rates of participation among those with a short version of 5HTT when they live in a politically contentious environment.

Conflict Avoidance and Stress Reactivity

Our claims are well situated within the political psychology literature. While we are examining gene-environment interactions, and while these may seem far removed from normally examined sources of individual heterogeneity, we argue that they logically complement existing arguments within more mainstream political science. In more generic terms, we suggest that the experience of living in a neighborhood that is politically contentious, or being a political outsider in one's community, may have the effect of dampening turnout among those who seek to avoid contention. The exposure to diverse, conflicting viewpoints (or exposure to viewpoints with which one consistently disagrees) may influence these people to withdraw from the political environment and discourage them from voting.

Previous research on conflict avoidance gives some indication that this may be true (Denny and Doyle, 2008). Conflict avoidance traits may be shared by a large minority of people. In one study, Hibbing and Theiss-Morse (2002) report that 26% of respondents in a nationally representative sample agree with the statement, "When people argue about political issues, you feel uneasy and uncomfortable." Although the authors did not measure voter turnout explicitly, people who agree with this statement are more likely to support "stealth democracy," a form of government where democratic procedures exist but are not visible and where ordinary people do not need to get involved with politics. Not all studies find an association between conflict avoidance and voter turnout (Ulbig and Funk, 1999; Blais and Labbe-St-Vincent, 2010). However, it is important to consider heterogeneity in the political environment in addition to heterogeneity in individual differences; as Ulbig and Funk (1999) suggest, we should only expect individual differences in conflict avoidance to be relevant when political action entails conflict. Studies that do not treat the political environment, and the act of voting, as uniformly contentious activities do tend to find an effect for conflict avoidance. For example, Mutz (2002) finds an interaction effect between conflict avoidance and cross-cutting influences, with the effects of the cross-cutting influence only affecting those who are conflict

avoidant.

To summarize: Exposure to political contention can make the political world seem threatening. This contention may be created in several ways. One possibility is by exposure in one's neighborhood to heterogeneous political beliefs, which can create social encounters and discussion networks around an individual that are potentially more contentious and conflictual. Another possibility is that being a political outsider in one's broader community generates feelings of social and political estrangement. For those people who are more susceptible to having adverse reactions to threatening stimuli, either of these situations may have the effect of depressing voter turnout.

Study 1: Partisan Heterogeneity

Political Threat in the Neighborhood Context

We first conceptualize a politically contentious environment as one in which there are approximately equal numbers of partisans from each of the two major parties, Democrats and Republicans. Living in a precinct where there are approximately equal numbers of Democrats and Republicans leads to increased exposure to different political beliefs. Our understanding of the political contention created in heterogeneous environments is conceptually different from a measure of political competition itself, in that competition is not likely to occur at such a local level as the precinct. Candidates do not visit voter precincts, *per se*, and the residents of one neighborhood are unlikely to receive more campaign exposure than residents in an adjoining neighborhood.

However, decades of research on the political context indicate that the social and political composition of a neighborhood influences the political behavior of its residents (Huckfeldt, 1979; Giles and Dantico, 1982; Kenny, 1992; Gimpel, Dyck and Shaw, 2004; Cho, Gimpel and Dyck, 2006; Bélanger and Eagles, 2007). Explanations for how the context can affect political behavior suggest that the interactions of the information setting, the context's structural properties, and the receptivity of the individuals to influence all shape

the effect of the environment (Books and Prysby, 1991). The composition of a neighborhood's population structures the social relations and patterns of social interaction within the environment (Huckfeldt, 1986) and the construction of a person's social network is contingent in part on the characteristics of the broader social context (Huckfeldt, Johnson and Sprague, 2004). The heterogeneity of one's geographic area is correlated with the diversity of opinion in one's reported discussion network (Pattie and Johnston, 2000; Campbell, 2006), and for some people, the cross-pressures and ambivalence created by diverse conversational networks may actually suppress participation, perhaps because people in these networks make up their mind later in the campaign and have less opportunity to participate (Mutz, 2002).

Partisan heterogeneity certainly has the potential for many normatively good outcomes (MacKuen, 1990; Sunstein, 2001; McLeod et al., 1999) but it can also create a contentious political environment that promotes norms of competition over those of cooperation or civic responsibility (Campbell, 2006). This environment can be stressful, as people seek to reconcile conflicting messages (Festinger, 1957). However, we do not expect that a contentious political environment will have the same effect on all people. We hypothesize instead that a person's sensitivity to stress and conflict may moderate his or her reaction to living in an environment with political stressors. More precisely, we hypothesize that those who are genetically predisposed to process social stress less efficiently will be less likely to vote when they live in a politically contentious neighborhood.

Data and Methods

Sample The sample is comprised of undergraduate psychology students at San Diego State University recruited between the fall of 1999 and the spring of 2007. These subjects volunteered to participate in a study, were paid for their participation, and gave written consent. The original study was approved by both the University of California, San Diego, and San Diego State Institutional Review Boards. In addition, the study genotyped a majority of the sample for

the 5HTT polymorphism. See Stein, Schork and Gelernter (2004) for a more detailed description of the sample.

In order to determine whether subjects were registered voters in the 2008 election, they were matched with public voting records available through the California Secretary of State's office. Voter records are as of June, 2009. The matching process utilized available personal information including full name, date of birth, phone number, and email address. We were able to match 74% of the subjects from the sample, which is consistent with the fact that 75% of eligible Californians were registered to vote as of the November 2008 election.¹ The fact that over 90% of San Diego State students come from within California² also likely improved our ability to match subjects to the voter files.

Political Contextual Data In 1981, the California State Legislature established the Statewide Database to facilitate the redistricting process, and in 1993 the database was permanently established to facilitate evaluation of the political and demographic composition of the state. The Statewide Database collects data on registration and voting from all county registrar offices in the state and uses Geographical Information Systems technology to convert the data into geographically informative files reported by precinct, census divisions, or zip code.

Our unit of analysis at the contextual level is the voter precinct. In California, precincts range in size from only a handful of voters to almost 7,000 voters, although 75% of precincts have fewer than 1,000 voters. They also tend to represent a relatively small geographic area. Rural areas have geographically larger precincts than do urban areas, but generally speaking at this level of aggregation, we are measuring the political composition of a respondent's immediate neighborhood.

The addresses of respondents acquired from the voting records were geocoded using the StreetMapUSA database setting the address match thresh-

¹<http://www.sos.ca.gov/elections/sov/historical-voter-reg/hist-voter-reg-and-part-general-elections-1910-2009.pdf>

²<http://asir.sdsu.edu/app/index.cfm>

old at 80%. Approximately 90% of the sample was matched automatically, with hand-coding matching an additional 3%. For respondents whose addresses were not able to be matched in this way, a conversion file was used to identify the Statewide Database precinct identification code. A total of 663 respondents were matched to their precinct. Respondents in the sample lived in 32 different counties in California. Most respondents lived in San Diego County, but significant numbers also lived in Los Angeles County and Orange County. Respondents lived in 541 different precincts in the state. Figure 4.2 shows that the precincts in which the respondents lived were slightly more competitive and less skewed in favor of the Democratic Party than in the state overall. Reflective of the fact that many of our respondents live in urban areas in southern California, our sample also had a significantly larger mean precinct size, and a slightly, but significantly, lower registered voter turnout rate.

One way to characterize the political environment of a precinct is by examining the proportion of people living in the precinct who are registered with one of the two main parties. Using the contextual data, we constructed the absolute difference between the number of registered Democrats and Republicans in a precinct in relation to the total number of registered voters. A difference of zero would indicate an equal number of Republicans and Democrats in the precinct, and thus the highest level of heterogeneity, whereas a value of one would signify one-party domination of a precinct. Therefore, we converted the measure so that higher values on the scale indicate higher levels of partisan heterogeneity. The precinct-level measure of partisan heterogeneity we use in this paper is:

$$Partisan\ Heterogeneity = 1 - \left| \frac{N\ Reg.Democrats - N\ Reg.Republicans}{N\ TotalRegistered} \right|$$

Summary statistics for the sample are presented in Table 4.1. A visualization of the distribution of partisan heterogeneity in midtown San Diego (Figure 4.3) can be found in the Appendix.

5HTT and Population Stratification Genetic association studies are sensitive to what is known as population stratification. Population stratification occurs when groups have different allele frequencies due to their genetic ancestry. Political behavior in these groups may be affected by their environments, alleles other than the one of interest, or some unobserved factor. Once these two groups mix in a larger population, simply comparing the frequency of an allele to the number of individuals exhibiting a behavior would lead to a spurious association.

Unfortunately, subpopulations cannot be directly observed. However, there are several techniques regularly utilized in the literature to attempt to ameliorate the problem of population stratification. One approach is the structured association method (Pritchard, Stephens and Donnelly, 2000). Structured association is a clustering technique that assumes a sample is made up of a mixture of individuals drawn from K subpopulations where K is likely unknown. Subpopulations are identified based on allele frequencies of polymorphisms spread across the genome, grouping individuals who are genetically similar to one another. Individuals may be assigned to more than one subpopulation if their genetic information suggests that they are admixed. Tests of association can then be conditional on subpopulation assignment. Assignments to three population groups were derived from an analysis of 36 genetic markers using the software package STRUCTURE. STRUCTURE adopts a Bayesian cluster approach to find the optimal number of clusters, under the main modeling assumptions of Hardy-Weinberg equilibrium within populations and complete linkage equilibrium between loci within populations (Pritchard, Stephens and Donnelly, 2000). The goal is to identify population groupings that are not in disequilibrium (Pritchard, Stephens and Donnelly, 2000). A more detailed description of the ancestry-informative marker panel used here can be found in Yang et al. (2005).

Model To test for an association with turnout between the interaction of the short 5HTT allele with partisan heterogeneity we employed the simple logistic

Table 4.1: Key summary statistics for all complete cases in the data by the number of short copies of the 5HTT allele.

	Observations	Mean	Std. Dev.	Min	Max
0 Alleles	161				
Vote		0.71	0.45	0.00	1.00
Heterogeneity		80.54	14.03	34.39	99.76
Male		0.29	0.46	0.00	1.00
Age		23.79	2.43	20.00	33.00
Democrat		0.38	0.49	0.00	1.00
1 Allele	259				
Vote		0.80	0.40	0.00	1.00
Heterogeneity		81.01	13.66	23.76	100.00
Male		0.26	0.44	0.00	1.00
Age		24.02	2.57	20.00	35.00
Democrat		0.44	0.50	0.00	1.00
2 Alleles	142				
Vote		0.79	0.41	0.00	1.00
Heterogeneity		83.02	12.53	32.02	99.89
Male		0.24	0.43	0.00	1.00
Age		23.91	2.38	20.00	29.00
Democrat		0.49	0.50	0.00	1.00

regression:

$$\text{logit}(P[\text{Partisan attachment}=1]) = B_0 + B_1\text{SHORT} + B_2\text{HET} + B_3\text{SHORT}*\text{HET} \\ + B_4\text{Age} + B_5\text{Male} + B_6\text{SP1} + B_7\text{SP2}$$

where SHORT is the number of short 5HTT alleles (0, 1, 2), HET is our measure of partisan heterogeneity, AGE is age in 2008, and MALE is an indicator variable for whether the subject is male (1) or female (0). SP1 and SP2 are the subpopulation assignments.

Results Table 4.2 shows the result of the base model with no interaction in the first column, and the model with the interaction term specified in the second column. In the base model, we see that heterogeneity has a negative and significant effect on voter turnout but that there is no direct effect of having an increased number of short alleles. In the interaction model, however, we see that the partisan heterogeneity within the respondent's precinct does not have an effect for those people lacking a short allele, as the coefficient of the variable is insignificant. Interestingly, short alleles have a significant and positive effect on turnout. However, for each additional short allele, the partisan heterogeneity in the district has a significant and negative effect on voter turnout at the 90% confidence level.

Simulating the effects of our explanatory variables can help us interpret their effect sizes. For respondents with two short 5HTT alleles, moving from the neighborhood with the lowest partisan heterogeneity to the neighborhood with the highest predicts a 30.1% decrease in the probability of turning out (95% CI: 13.3, 44.5). However, for a person with no short alleles, neighborhood composition has no effect (4.9%, 95% CI: -28.6%, 52.2%). Thus, although people with at least one short 5HTT allele are more likely to vote in non-heterogeneous environments, they become increasingly likely to abstain as their neighborhood gets more and more heterogeneous.

The results from the first study support the idea that partisan heterogeneity in the neighborhood has differential effects on voter turnout, depending on the number of short 5HTT alleles a person has. Although the regression design cannot identify the mechanism behind the effect, the results are consistent with the theory that a sensitivity to social stress may be involved.

Table 4.2: Regression results for interaction between 5HTT and precinct level heterogeneity.

	Model 1	Model 2
(Intercept)	3.168*	1.711
	(1.252)	(1.431)
Short * Heterogeneity		−0.022 [†]
		(0.012)
Short	0.226	2.084*
	(0.142)	(0.994)
Heterogeneity	−0.017*	0.000
	(0.008)	(0.012)
Age	−0.014	−0.012
	(0.041)	(0.041)
Male	0.203	0.195
	(0.236)	(0.237)
SP1	−0.575	−0.600 [†]
	(0.351)	(0.352)
SP2	−0.733	−0.765 [†]
	(0.456)	(0.458)
<i>N</i>	562	562
AIC	608.029	606.359
BIC	729.311	744.967
log <i>L</i>	−276.015	−271.180

Standard errors in parentheses

[†] significant at $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Study 2: Partisan Minority Status in the County

The second study in this chapter considers political contention of a different form, at a different level of geographic aggregation. However, the underlying theory is the same: people who carry short alleles of 5HTT are more sensitive to the perception of threat in their political environment, with the consequence that they are less likely to turn out and vote when they experience contentious politics.

Political Threat in the County Context

Scholars agree that political elites have polarized, whether measured by interest group ratings (Poole and Rosenthal, 1984), NOMINATE scores (Poole and Rosenthal, 1997; McCarty, Poole and Rosenthal, 2006), or measures of party vote percentages and party unity scores (Fleisher and Bond, 2000; Stonecash, Brewer and Mariani, 2003). The remaining question is the extent to which the mass public has polarized in its political attitudes and ideology. While Fiorina and Abrams (2008) argue that the mass public is not polarizing, Abramowitz and Saunders (2008) argue that the electorate has sorted itself so that ideology better explains citizens' party identification than it did in the 1970s, creating more homogeneity within the parties. Consequently, we observe higher levels of polarization. This sorting has consequences; Jacobson (2007) argues that approval of President Bush and approval of the war in Iraq—attitudes strongly tied to partisanship—explain vote choice much more strongly than analogous attitudes have historically.

Alongside this trend toward polarization, some scholars argue that we've observed increasing geographic sorting along factors associated with partisanship and ideology, such as race, education, and income. Bishop and Cushing (2008) report that although recent presidential elections have been more competitive, an increasing number of counties have large and stable partisan majorities. In 2004, they note that in six out of ten counties, the margin between parties was 20 percentage points or more, meaning that 48% of American voters

lived in counties where the outcome of the election was a foregone conclusion. Although Abrams and Fiorina (2012) find several faults with the calculations made and conclusions drawn in Bishop and Cushing (2008), they do not disagree "that sub-groups of Americans are becoming more like-minded, that they are becoming increasingly ideologically inbred, and that they have difficulty comprehending people unlike them" (Abrams and Fiorina, 2012, p. 208).

To the extent that counties are becoming less balanced and have large majorities of voters aligning with one party over the other, we simultaneously see a growing number of people who are extreme "partisan minorities" in their community, people who identify with a party or ideology that is a small minority. How does being a partisan minority in the county affect the experience of politics? The partisan balance in a county could affect both the social encounters one has and the broader norms and policies in the community at large. Counties that are strong bastions of support for one party, while not pivotal in the outcome of federal general election races, are often especially important in primary races. There is anecdotal evidence that "communities with landslide majorities have a different kind of politics" than more competitive areas (Bishop and Cushing, 2008).

Although there has not been extensive work addressing this, there is some evidence that political minorities are aware of their status. For example, Bishop and Cushing (2008) report several anecdotes where partisan minorities were not only aware of their status as being "out of step" with the community, but were unwilling to publicly identify with their party for fear of stigma or retaliation (Bishop and Cushing, 2008, p. 66). A recent nationally representative study found that about 10% of respondents agree that they feel like an "outsider" in their community, although this perception was not validated against an objective measurement of whether their political beliefs were different than the majority in the community (Karpowitz et al., 2012).

Partisan minorities are subject to a variety of social psychological and attitudinal effects (Bishop and Cushing, 2008). Environments of political homogeneity make it difficult to express an opposing opinion (Noelle-Neuman,

1993) and when the views of only one party are represented, the tension felt by those who disagree with the majority opinion could be especially intense. Campbell (2006) notes that a high level of homogeneity may have negative consequences for those people who perceive that they are "political outsiders." Using data from the Social Capital Community Benchmark Survey, he finds that individuals whose ideology deviates from the mean ideology in their communities are less trusting of the people in their communities (Campbell, 2006, p. 73-75). Those in a political minority may also have less trust in the system. (Karpowitz et al., 2011) find that political minorities are most concerned about voting privacy and are the hardest to reassure that voting conditions will safeguard the confidentiality of their vote choices. A classic study from the 1970s may shed some light on the mechanism behind these findings. Finifter (1974) finds that "political deviants," those people who are most at odds with their broader social groups and community norms, are most likely to seek out workplace friendships. While a clear explanation for this result is not given, Finifter suggests that deviation increases anxiety, a sense of isolation, the need to question one's opinions, and cognitive dissonance. Establishing a close and integrated friendship group may help political deviants protect against these negative psychological outcomes.

The social psychological consequences of being a political minority have important implications on political attitudes. There was early interest in the question of the effect of community composition on partisan minority vote choice. People predisposed to support one party—based on their demographics, issue positions, or partisanship—are more likely to vote for the opposition party when they live in communities with a high proportion of opposition supporters (Miller, 1956). Putnam (1966), using the same data from the 1952 presidential election, finds support for a "social integration" theory, whereby community influence is mediated through personal contact with other members of the community. He argues that there is increased conformity to majority opinion among those partisan minorities who are more involved with community associations. However, the composition of the friendship group matters as

well: those respondents who had friendship networks comprised of other partisan minorities were buffered from the effects of community composition, even though that network diverged from the overall distribution in the community. However, those minorities who had friends mostly of the majority party were *also* more likely to vote with their friends, thus conforming to the larger norms of the community. Huckfeldt and colleagues have shown that diverse opinions can and do survive in social networks (Huckfeldt, Johnson and Sprague, 2004), but the survival of those opinions may come at a cost.

Paired with the reduced relationship between partisan predispositions and vote choice for those people who are minorities, the social-psychological consequences of minority status may have implications for participation, as well. Miller (1956) suggests lower turnout among partisan minorities in the 1952 election. The cross-pressures and ambivalence created by diverse conversational networks may actually suppress participation perhaps because people in these networks make up their mind later in the campaign and have less opportunity to participate (Mutz, 2002), though this effect may be limited to those who are political minorities in their neighborhood (McClurg, 2006). Campbell (2006) notes that aggregate turnout may be high in both communities with high and low levels of political homogeneity, but for different reasons. In politically homogenous communities, residents may perceive shared norms and values that promote voting out of a sense of civic duty, while in politically heterogeneous communities, turnout may be driven by intense partisan competition. However, Campbell does not study whether minorities in homogeneous communities of the opposition party are equally likely to vote, but a more recent nationally-representative study finds that those people who label themselves as "outsiders" in their community are less likely to report voting (Karpowitz et al., 2012).

The consequences of this phenomenon may be far reaching even beyond participation. Experimental research that has sought to foster deliberation often finds that homogeneity breeds greater extremism (Schkade, Sunstein and Hastie, 2006). Majorities living in landslide counties thus have several

mechanisms that foster continuing homogeneity: the dominance of one political party that has disproportionately strong organizational power; reinforcing civic norms that foster participation and civic-minded behavior out of a desire to conform to group norms; attitudinal homogeneity that reinforces extreme thinking; and an increased sense of misunderstanding of "those people" who think differently about the political world. While the population broadly may be susceptible to the effects of being a partisan minority, our theory suggests that some people should be more vulnerable than others. Only one study to date has considered this possibility, and consistent with our theory it suggests that people who score highly on measures of neuroticism are more likely to identify as outsiders (Karpowitz et al., 2012).

Data and Methods

Sample Characteristics We use data from the National Longitudinal Study of Adolescent Health (Add Health) to examine the interaction between the 5HTT region of the SLC6A4 gene and the effect of being a partisan minority in the county. Add Health is a large study originated in 1994-1995 that explores the causes of health-related behavior of adolescents in grades 7 through 12 and their outcomes in young adulthood. In addition to health-related information, a large amount of information has been collected about the personality, attitudes, relationships, religious beliefs, civic activities, and political beliefs and behaviors of the respondents. The initial wave of the study utilized a sampling design that resulted in a nationally representative study: women make up 49% of the study's participants, Hispanics 12.2%, Blacks 16.0%, Asians 3.3%, and Native Americans 2.2%. Participants in Add Health also represent all regions of the country: the Northeast makes up 17% of the sample, the South 27%, the Midwest 19%, and the West 17%. Wave I included a 45-minute in-school questionnaire to 90,118 students from 145 middle, junior high, and high schools. From these respondents, a core random sample of 12,105 adolescents in grades 7-12 was drawn plus several over-samples, totaling more than 27,000 adolescents. These students and their parents were administered in-home surveys in

the first wave. Wave II (1996) was comprised of another set of in-home interviews of 15,170 students from the Wave I sample. Wave III (2001-2002) consisted of an in-home interview with the 15,170 Wave II participants, and Wave IV followed up with additional interviews and biological specimen collection in 2007-2008.

In Wave I of the Add Health study, researchers created a genetically informative sample of sibling pairs based on a screening of the in-school sample of 90,114 adolescents. These pairs include all adolescents that were identified as twin pairs, half siblings, or unrelated siblings raised together. Twins and half biological siblings were sampled with certainty. The Wave I sibling-pairs sample has been found to be similar in demographic composition to the full Add Health sample (Jacobson and Rowe, 1998). Genetic markers are available for 2,574 individuals, including markers that identify alleles of 5HTT. Details of the DNA collection and genotyping process are available at the Add Health website;³ this part of the study has been described elsewhere (Fowler, Baker and Dawes, 2008).

As of the spring of 2012, the study now contains genetically informative data for almost all of the 15,170 respondents who participated in the Wave III and Wave IV studies. More detailed description of the study and genetic data can be found on the study web page.⁴ The sample is now large enough to allow for an internal replication of any significant gene x environment interaction, treating the two data releases as separate studies. The original study has 2,574 related individuals, and the replication study has genetic markers for the remaining 12,607 individuals in the Wave III study.

Measures of Voting and Political Context Political variables were measured in the Wave III study when subjects were young adults (age 18-26). The dependent variable in this analysis is a dichotomous measure of whether the respondent voted in the 2000 presidential election. The question form is a non-standard measure of self-reported voter turnout, asking "Did you vote in

³<http://www.cpc.unc.edu/projects/addhealth>

⁴<http://www.cpc.unc.edu/projects/addhealth>

the most recent presidential election?" and offering respondents the choice of "yes," "no," "I don't know," and "not applicable" in addition to the ability to skip the question. The question refers to the 2000 election, and was only asked of respondents who were 18 by the date of the election.

Critical for this study are two sets of contextual data matched to the survey data. A large amount of data about the sociodemographics of each respondent's county was merged in from sources such as the United States Census, the Centers for Disease Control and Prevention, and the National Center for Health statistics. In addition to these variables, we assembled and merged in several variables related to the political context of the county. We choose to use a composite measure of election results to get the average proportion of the county that votes for each party, constructed from the Democratic and Republican party vote shares for statewide elections in the county between 1998 and 2001. Data is available from the presidential election in 2000, the gubernatorial election in the state that occurred between 1997-2001, and the senatorial elections in 1998 and 2000. The measure of "Opposition Party Vote Share" is constructed from the Republican vote share in the county for those respondents who identify as Democrats or liberals, and the Democratic vote share in the county for those respondents who identify as Republicans or conservatives. This combined measure of political identification was used to increase the sample size; when ideology and party were in conflict with one another (i.e. liberal Republicans or conservative Democrats), partisan identification was used as the basis for determining the correct opposition party vote share.

5HTT and Population Stratification As described above for the California study, there are several techniques regularly utilized in the literature to attempt to ameliorate the problem of population stratification. In the original Add Health sample, because the data was comprised of related individuals, we are able to run a family based test. This is preferable because it eliminates the problem of population stratification by using family members, such as parents or siblings, as controls. Tests using family data compare whether

offspring exhibiting the trait receive a particular allele from their parents more often than would be expected by chance. Family based tests do not rely on twins to study genetic variation; any kind of close family relation can be used (siblings, parents, etc.). Gaudeman (2003) showed that the family-based quantitative disequilibrium transmission test (QTDT) of association (Fulker et al., 1999; Abecasis, Cardon and Cookson, 2000) could be extended to accommodate gene-environment interactions. Using this test significantly reduces the sample size given that respondents who have the same number of short alleles as their family average are not informative in estimating the within-family component. Thus, we also present the results of a fully specified model that incorporates the entire original sample to reduce the standard error of the estimate for the between-family component of the effect of 5HTT. Table 4.3 presents a summary of the variables in the original sample.

The models in the replication sample (and the results from the full sample) are run using a case control approach. Case-control designs compare the frequency of alleles or genotypes among subjects that exhibit a trait of interest to subjects who do not. As a result, case-control designs are vulnerable to population stratification if either group is especially prone to selection effects. A typical way to control for this problem is to include controls for the race or ethnicity of the subject or to limit the analysis to a specific racial or ethnic group. Thus, in the case control models, we include controls for a respondent's ethnicity, with "White/Caucasian" serving as the omitted reference category. Table 4.4 presents a summary of the variables in the replication sample.

In the analysis presented, we measure the number of short alleles of 5HTT a respondent has, ranging from 0 to 2. However, we note that our results remain largely robust to a dichotomous specification of the variable. Table 4.5 shows the key variable distributions by the number of short alleles a respondent has in the combined sample.

Table 4.3: Summary statistics for original Add Health sample. "Political Identity" indicates the number of respondents who indicated either a partisan affiliation or an ideological orientation on the survey. The reported proportion is of those respondents who identify either as Democrats or as non-Republican liberals.

	Obs.	Mean	Std. Dev.	Min	Max
Total Sample	2574				
Individual Variables					
Vote	2547	0.44	0.50	0.00	1.00
Male	2574	0.48	0.50	0.00	1.00
Age	2574	21.97	1.67	18.00	26.00
Political Identity	1386	0.51	0.50	0.00	1.00
Education	2572	13.35	1.98	7.00	22.00
Employment	2426	0.74	0.44	0.00	1.00
Contextual Variables					
Opp. Party Vote Share	1331	0.46	0.12	0.09	0.86
Urban	2484	0.68	0.38	0.00	1.00
College Degree	2484	0.24	0.08	0.06	0.53
Unemployed	2484	0.06	0.02	0.02	0.14
Median Hhold. Income	2484	42047.98	9276.58	18500.00	79900.00

Table 4.4: Summary statistics for replication Add Health sample. "Political Identity" indicates the number of respondents who indicated either a partisan affiliation or an ideological orientation on the survey. The reported proportion is of those respondents who identify either as Democrats or as non-Republican liberals.

	Obs.	Mean	Std. Dev.	Min	Max
Total Sample	12607				
Individual Variables					
Vote	12456	0.45	0.50	0.00	1.00
Male	12607	0.46	0.50	0.00	1.00
Age	12607	21.97	1.74	18.00	27.00
Political Identity	6711	0.58	0.49	0.00	1.00
Education	12595	13.23	1.95	6.00	22.00
Employment	11762	0.75	0.44	0.00	1.00
Contextual Variables					
Opp. Party Vote Share	6603	0.46	0.13	0.09	0.88
Urban	12405	0.71	0.37	0.00	1.00
College Degree	12405	0.24	0.08	0.06	0.60
Unemployed	12405	0.06	0.02	0.02	0.15
Median Hhold. Income	12405	42096.00	9767.39	16300.00	82900.00

Table 4.5: Summary statistics for combined Add Health sample, by number of short 5HTT alleles. "Political Identity" indicates the number of respondents who indicated either a partisan affiliation or an ideological orientation on the survey. The reported proportion is of those respondents who identify either as Democrats or as non-Republican liberals.

	Obs.	Mean	SD	Min.	Max.
0 Alleles	1461				
Vote		0.61	0.49	0	1
Opp. Party Voteshare		0.46	0.13	0.09	0.86
Male		0.45	0.50	0	1
Age		21.92	1.73	18	26
Political Identity		0.57	0.49	0.00	1.00
1 Allele	2944				
Vote		0.59	0.49	0	1
Opp. Party Voteshare		0.46	0.13	0.09	0.86
Male		0.47	0.50	0	1
Age		22.02	1.74	18	27
Political Identity		0.58	0.49	0.00	1.00
2 Alleles	1728				
Vote		0.56	0.50	0	1
Opp. Party Voteshare		0.46	0.13	0.09	0.88
Male		0.46	0.50	0	1
Age		22.09	1.68	18	26
Political Identity		0.57	0.50	0.00	1.00

Results All models are logistic regressions where the key term of interest is an interaction between opposition party vote share and a respondent's 5HTT allelic profile. Table 4.6 shows the results for the original sample using the family-based test approach. It appears that there are significant negative main effects of opposition party vote share, and positive but mostly insignificant main effects for increased transmission of short 5HTT alleles. Of most importance, however, is the negative and significant interaction term in the model. People who have a greater than average number of 5HTT alleles, compared to their siblings, are less likely to vote as the opposition party vote share increases in their county.

These results are replicated in Table 4.7 using the members of the sample who were not originally genotyped. Again we see positive but mostly insignificant coefficients for the number of short alleles of 5HTT a respondent has, although it appears that opposition party vote share no longer has a direct effect. The interaction term remains negative and significant, although it slips to significance at only the 90% level when additional controls are added to the model. In the final model where 5HTT is interacted with all contextual variables, the p-value is 0.104. Finally, Table 4.8 shows the results from the combined sample. In this model, the interaction term is negative and significant in the fully specified model. The p-value in the model with multiple interactions is 0.052, just barely missing the threshold of confidence at the 95% level. Although not all of the p-values reach conventional levels of significance, the pattern of results is clear: the interaction between the number of short alleles a respondent has and the opposition party vote share suggests that people who are sensitive to threat are less likely to vote when they are partisan minorities in their county. This finding is robust to a variety of specifications of opposition party vote share and dichotomous measures of the number of short alleles a respondent has.

Figure 4.1 visualizes these results. Predicted probabilities are generated by holding all variables in the model at their means, but varying the opposition party vote share and/or the number of short 5HTT alleles. The panel on the left

focuses on the effects of increasing opposition party vote share for respondents with two short alleles. Looking across the full range of vote share values in the sample, the predicted probability of voting moves from 68.1% when the respondent lives in a county where his or her own party has a vote share of 91%, to a 46.4% probability of voting when the opposition party has a vote share of 87%. The panel on the right shows a more restricted but more realistic comparison: the effects of moving from a county where the respondent is in the majority (opposition party vote share is 35%) to a county where the respondent is in the minority (opposition party vote share is 65%). Respondents with two copies of the short allele are 5.3 percentage points (95% CI: 4.22-8.69%) less likely to vote when they are in the minority as compared to when they are in the majority, with all other variables held constant at their means.

Table 4.6: Results of a family based test in the original sample: the base model, an interaction model, an interaction model with individual and county controls, an interaction model where 5HTT is interacted with all contextual variables (coefficients not shown), and an interaction model in the full sample, not just the informative respondents who differ from their siblings. All models are logistic regressions.

	Base Model	Interaction Model	Interaction with Controls	Multiple Interactions	Entire Sample
(Intercept)	1.813 (1.589)	1.974 (1.578)	1.416 (1.975)	1.412 (2.011)	-2.132 * (1.070)
Opposition Party Voteshare * w_Short		-2.211 [†] (1.474)	-2.791 * (1.536)	-3.291 * (1.640)	-3.022 * (1.654)
Opposition Party Voteshare	-1.921 * (0.196)	-1.945 * (1.513)	-1.832 * (1.599)	-1.916 * (1.699)	-1.328 ** (1.706)
w_Short	-0.098 (0.196)	0.925 [†] (0.718)	1.259 * (0.743)	1.877 (1.848)	1.819 (1.858)
b_Short	-0.193 (0.243)	-0.213 (0.243)	-0.050 (0.262)	-0.061 (0.264)	-0.057 (0.096)
Male	-0.052 (0.228)	-0.044 (0.230)	0.034 (0.247)	0.025 (0.249)	0.041 (0.127)
Age	-0.018 (0.068)	-0.025 (0.068)	-0.114 [†] (0.078)	-0.110 [†] (0.080)	-0.006 (0.039)
Education			0.230 *** (0.067)	0.227 *** (0.068)	0.256 *** (0.035)
Employed			0.057 (0.390)	0.058 (0.388)	0.086 (0.213)
Prop. Urban (c)			-0.306 (0.390)	-0.309 (0.388)	-0.445 * (0.213)
Prop. with College Degree (c)			-1.090 (2.144)	-1.098 (2.146)	-0.323 (1.026)
Prop. Unemploy. (c)			2.196 (7.485)	2.409 (7.582)	1.143 (3.964)
Median Hhold. Income (c)			-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
N	354	354	336	336	1239

Robust standard errors in parentheses

[†] significant at $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 4.7: Results of a case control test in the replication sample: the base model, an interaction model, an interaction model with individual and county controls, and an interaction model where 5HTT is interacted with all contextual variables (coefficients not shown). All models are logistic regressions.

	Base Model	Interaction Model	Interaction with Controls	Multiple Interactions
(Intercept)	-0.773 *	-1.060 **	-3.717 ***	-3.521 ***
	(0.373)	(0.403)	(0.536)	(0.663)
Opposition Party Voteshare * Short		-0.573 [†]	-0.559 [†]	-0.527
		(0.304)	(0.321)	(0.324)
Opposition Party Voteshare	-0.854 ***	-0.247	0.078	0.040
	(0.221)	(0.389)	(0.414)	(0.417)
Short	-0.045	0.218	0.207	0.021
	(0.040)	(0.145)	(0.153)	(0.400)
Male	-0.254 ***	-0.256 ***	-0.214 ***	-0.214 ***
	(0.056)	(0.056)	(0.060)	(0.060)
Age	0.079 ***	0.079 ***	0.041 *	0.041 *
	(0.016)	(0.016)	(0.018)	(0.018)
Black	0.185 **	0.186 **	0.285 ***	0.287 ***
	(0.067)	(0.067)	(0.077)	(0.077)
Latino	-0.472 ***	-0.473 ***	-0.332 ***	-0.331 ***
	(0.080)	(0.080)	(0.092)	(0.092)
Asian	-0.631 ***	-0.632 ***	-0.849 ***	-0.855 ***
	(0.115)	(0.115)	(0.128)	(0.128)
Native American	-0.259 [†]	-0.263 [†]	-0.225	-0.225
	(0.151)	(0.151)	(0.161)	(0.161)
Education			0.218 ***	0.218 ***
			(0.017)	(0.017)
Employed			0.111	0.111
			(0.068)	(0.068)
Prop. Urban (c)			-0.189 [†]	-0.162
			(0.104)	(0.178)
Prop. with College Degree (c)			1.782 ***	1.669 [†]
			(0.500)	(0.858)
Prop. Unemploy. (c)			2.007	0.220
			(2.000)	(3.335)
Median Hhold. Income			-0.000	-0.000
			(0.000)	(0.000)
N	5384	5384	5074	5074
AIC	7201.245	7199.688	6544.384	6551.812
BIC	7438.527	7463.335	6962.425	7074.363
log L	-3564.622	-3559.844	-3208.192	-3195.906

Standard errors in parentheses

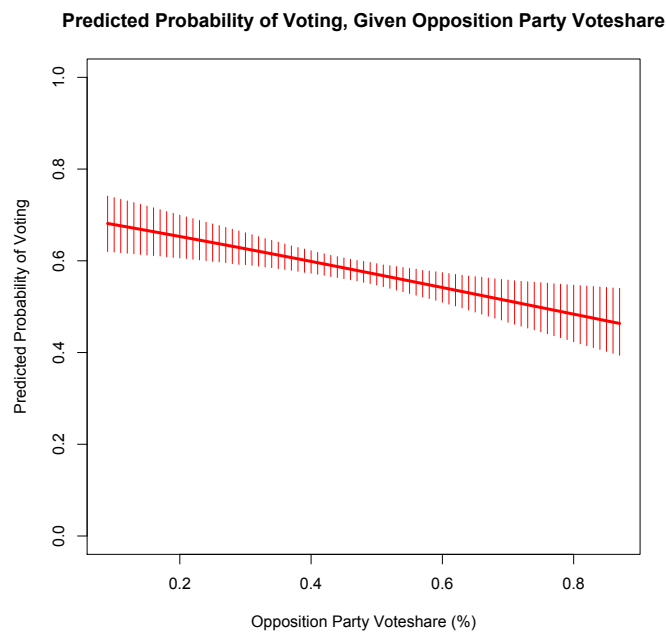
[†] significant at $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 4.8: Results of a case control test in the combined sample: the base model, an interaction model, an interaction model with individual and county controls, and an interaction model where 5HTT is interacted with all contextual variables (coefficients not shown). All models are logistic regressions.

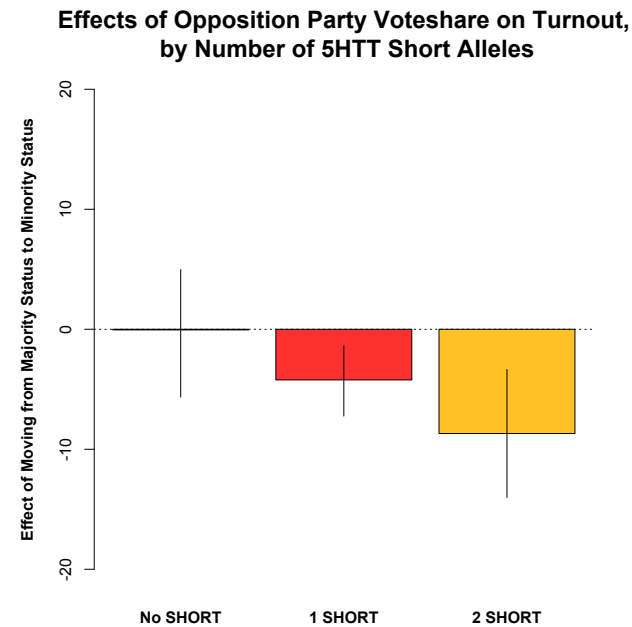
	Base Model	Interaction Model	Interaction with Controls	Multiple Interactions
(Intercept)	-0.614 [†] (0.342)	-0.905 * (0.370)	-3.534 *** (0.487)	-3.556 *** (0.600)
Opposition Party Voteshare * Short		-0.578 * (0.282)	-0.598 * (0.298)	-0.582 [†] (0.300)
Opposition Party Voteshare	-0.937 *** (0.203)	-0.324 (0.361)	0.015 (0.383)	0.001 (0.386)
Short	-0.052 (0.036)	0.213 (0.134)	0.227 (0.142)	0.243 (0.366)
Male	-0.205 *** (0.051)	-0.206 *** (0.051)	-0.159 ** (0.054)	-0.158 ** (0.054)
Age	0.072 *** (0.015)	0.073 *** (0.015)	0.029 [†] (0.016)	0.029 [†] (0.016)
Black	0.170 ** (0.061)	0.171 ** (0.061)	0.259 *** (0.070)	0.258 *** (0.070)
Latino	-0.503 *** (0.074)	-0.504 *** (0.074)	-0.370 *** (0.084)	-0.369 *** (0.084)
Asian	-0.604 *** (0.105)	-0.605 *** (0.105)	-0.787 *** (0.116)	-0.787 *** (0.117)
Native American	-0.225 (0.140)	-0.230 (0.140)	-0.172 (0.148)	-0.172 (0.148)
Education			0.225 *** (0.016)	0.225 *** (0.016)
Employed			0.118 [†] (0.062)	0.117 [†] (0.062)
Prop. Urban (c)			-0.224 * (0.094)	-0.178 (0.161)
Prop. with College Degree (c)			1.425 ** (0.453)	0.965 (0.775)
Prop. Unemploy. (c)			2.777 (1.818)	2.706 (3.013)
Median Hhold. Income (c)			-0.000 (0.000)	0.000 (0.000)
<i>N</i>	6497	6497	6133	6133
AIC	8700.851	8698.660	7922.127	7929.457
BIC	8944.898	8969.824	8352.299	8467.173
log <i>L</i>	-4314.425	-4309.330	-3897.063	-3884.729

Standard errors in parentheses

[†] significant at $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$



(a) Respondents with two short alleles



(b) Effects of opposition voteshare

Figure 4.1: Figures demonstrate that people with an increased number of 5HTT short alleles are less likely to vote as the opposition voteshare increases. Panel 4.1(a) shows the predicted probability of voting, given the opposition party voteshare, for respondents with two copies of the short allele. Panel 4.1(b) shows the change in predicted probability of voting by the number of short alleles, moving from a county where the respondent is in the majority (opposition party voteshare is 35%) to a county where the respondent is in the minority (opposition party voteshare is 65%).

Discussion

However well-studied the effect of being exposed to conflictual political influences in one's social network and environment, previous studies have not sufficiently considered the role that innate individual predispositions play in moderating the effect of the environment. Our results show that people who carry an allele that may predispose them to being conflict averse are more likely to abstain from voting when they live in an environment marked by political contention. To our knowledge, this represents the first set of studies measuring the effect on voter turnout of an interaction between a gene and an explicitly political environment.

We address two very different types of conflictual political environments. In the first study, we consider the effects of exposure to partisan heterogeneity in one's neighborhood, while in the second, we consider the effect of being a partisan minority in a larger definition of the community, the county. Although there are certainly many differences between these two conceptualizations, we argue that the underlying mechanism of the effect of political contention is the same. For some people, exposure to political contention may very well motivate political participation, especially when other factors known to increase turnout—such as advertising and campaign spending—are part of the political climate. However, for people susceptible to feeling threatened, political contention acts to dampen turnout and discourage engagement, perhaps as a kind of defense mechanism to avoid encountering a threatening environment.

The consideration that the environment may have heterogeneous effects based on innate, individual differences between people is an important step forward in political science, and we should be guided by the development of the approach in other fields. As Shanahan and Hofer (2005) note, much of the previous work on gene x environment interactions has focused on genetic diatheses, an approach that implicitly assumes that some individuals are particularly vulnerable to adversity and focuses on identifying adverse environmental exposures that trigger genetic predispositions toward less socially de-

sirable outcomes. However, as Belsky and others suggest (Belsky, Bakermans-Kranenburg and van IJzendoorn, 2007; Belsky et al., 2009; Boyce and Ellis, 2005) moving instead to a notion of "differential susceptibility" allows us to consider that some individuals are simply more responsive to their environments—they are more susceptible to adversity but also more receptive to supportive environments. This could explain the positive coefficient on the main effect of the number of short alleles in several of the model specifications, including the significant positive coefficient in the results in the first study. The serotonin transporter gene 5HTT is one of the genes which has been suggested in the differential susceptibility literature; it is possible that carrying one or more short alleles of 5HTT may make people less likely to vote in contentious contexts but more likely to vote when they receive reinforcement of their political beliefs from their environment.

However, these results are important not just for scholars interested in individual differences, but also for those interested in better understanding the mechanisms of environmental influence. The gene x environment framework acknowledges that genes affect behavior in large part because of the way they affect interpretation and integration of environmental influences. Political scientists can contribute a vast knowledge about which aspects of the environment may be most likely to have differential effects based on individuals' predispositions. Just as we borrow techniques from other disciplines, political scientists should take an active role in helping other scholars better theorize and measure environmental effects.

There are several limitations to our studies. Residential location is not assigned randomly to our respondents and the issue of self-selection into a geographic area is a near perpetual threat for contextual analysis. We argue that the effects of this self-selection should be minimal, particularly in the first study. While self-sorting has been documented in California (Douzet, Kousser and Miller, 2008), this sorting is typically along socioeconomic and racial dimensions. Political heterogeneity is likely associated with these other measures, but we contend that people are not likely to pick the exact location of

their home within a city based on their perception of the partisan division of that area. Furthermore, for the self-selection argument to be relevant in this case, people with a short allele of 5HTT would have to be more likely to select into environments with political heterogeneity whereas those without a copy of the short allele would have to move into more homogenous environments. This runs opposite to the theorized effect of the gene, and 5HTT was not predictive of precinct heterogeneity in our sample ($p=0.16$).

Particular caution should be applied to the first study. Our sample is small, and future studies should seek to replicate this finding in larger samples. A reasonable argument can be made that California may not be representative of the political climate of the United States at large. On a macro level, California is certainly unique in many respects. However, it is difficult to argue that the experience of living within a neighborhood characterized by political heterogeneity, or interacting with neighbors whose views differ from one's own, is fundamentally different in California than in other communities in the United States. The finding about neighborhood heterogeneity is not replicated in this paper and the current finding should be viewed as provisional. Nonetheless, it is suggestive of an explanation as to why cross-cutting pressures can be shown to have different and often-times contradictory results.

More generally, incorporating measures of individual differences within our studies of voter behavior have the potential to give us leverage in understanding the mechanism by which the political environment matters in shaping political outcomes. By acknowledging that voters will have heterogenous responses to the same environmental stimuli, we can refine our models and analysis to better understand what motivates people to become politically engaged.

The analysis presented in this chapter is currently being prepared for publication: Settle, Jaime, Peter J. Loewen and Christopher Dawes, "Political Contention and Stress Sensitivity Interact to Affect Voter Turnout." I was the primary researcher on this paper and was responsible for matching the contextual data, analyzing the data, and writing the manuscript.

Appendix

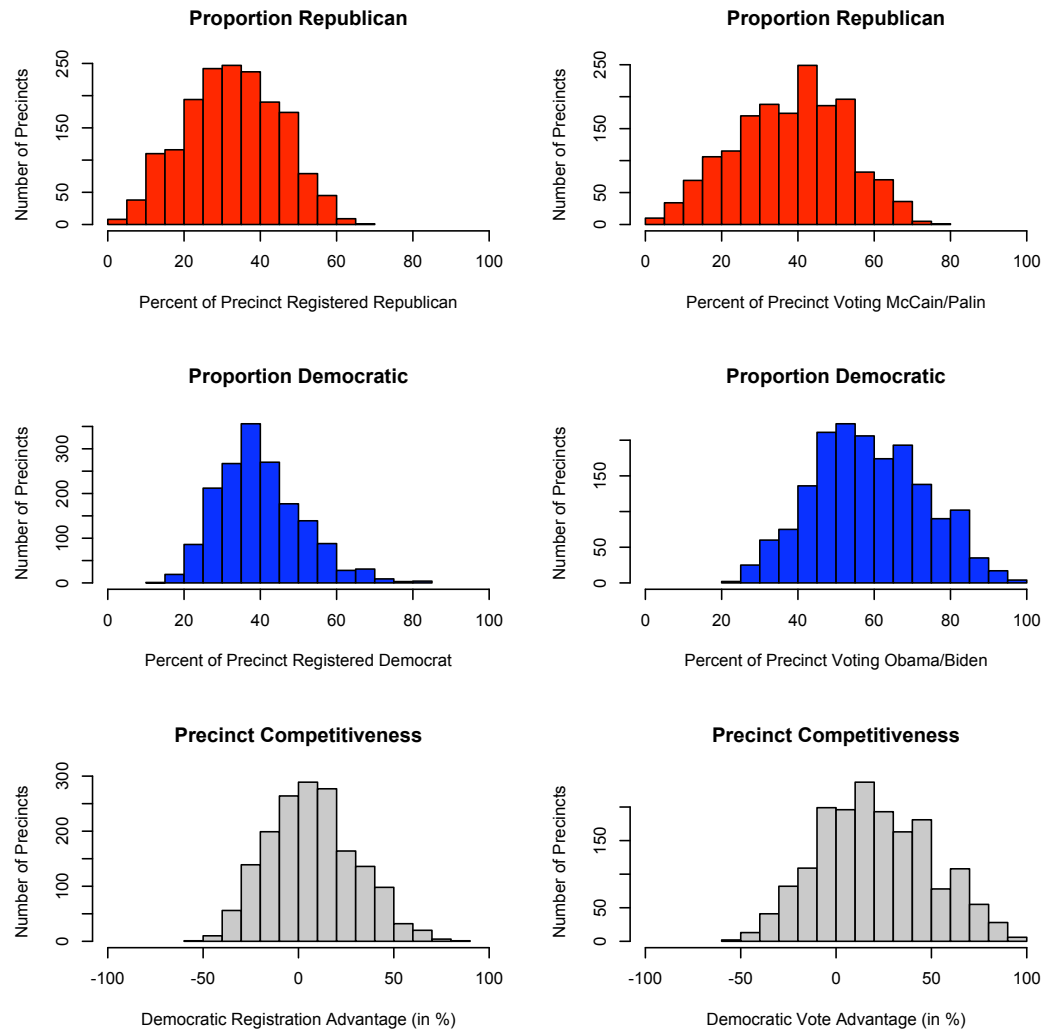


Figure 4.2: The partisan characteristics of the precincts represented by respondents in the sample.

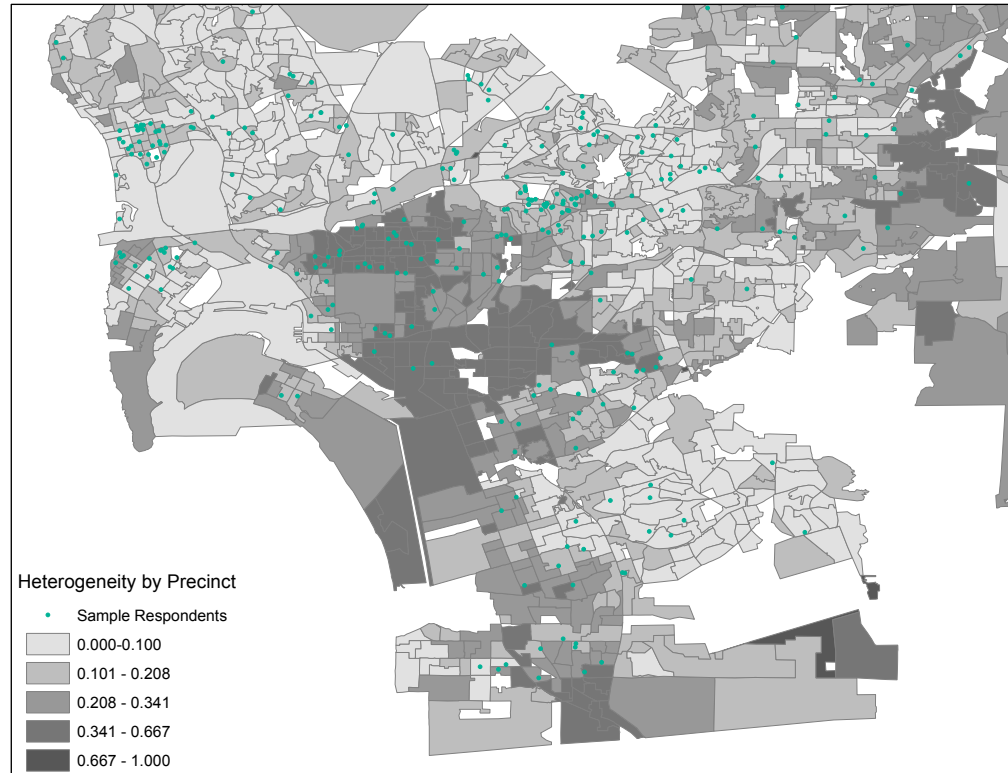


Figure 4.3: The partisan heterogeneity of midtown San Diego. Green dots represent the residences of users in the sample.

Chapter 5

Negative Affectivity, Political Contention and Turnout: A Genopolitics Field Experiment

Introduction

Research on the role of anxiety and neuroticism—two facets of the broader trait of negative affectivity—leads us to conjecture that, *ceteris paribus*, these traits should heighten a person’s sensitivity to emotion-inducing stimuli about the competitiveness of elections with the effect of reducing the likelihood of turning out to vote. The results from the previous chapter offer suggestive evidence for this relationship, but the use of observational data raises the possibility that the results are endogenous.

In this chapter, we demonstrate using a field experiment that political competition has contradictory effects on the likelihood of participating in politics. These contradicting effects can be attributed to individual differences in negative affectivity, which largely precede engagement with politics. We conducted our experiment on a sample of 761 registered California voters that had previously been genotyped for genetic variants associated with traits related to anxiety and neuroticism. We designed a postcard mobilization treatment

meant to induce an emotional response to the degree of competition in an election and delivered the treatment to 380 subjects randomly selected from our overall sample in the week prior to the November 2010 midterm elections. We find that those individuals who are genetically predisposed towards negative affectivity are less likely to vote when exposed to an exogenous increase in political contention. Conversely, those who are not genetically predisposed to negative affectivity appear more likely to vote when exposed to an increase in political contention. This represents the first biologically informed field experiment in political science of which we are aware.

Background and Hypotheses

This chapter builds directly on the theory and findings described in the previous chapter. In Chapter 4, we demonstrate that a single genetic variant conceptually related to negative affectivity—the short allele of 5HTT—is associated with decreased voter turnout under conditions of higher political threat. The results presented in this chapter strengthen the previous findings in two important ways. First, we expand upon the measurement of negative affectivity to incorporate a broader range of genetic variation. Second, we exogenously expose respondents to competition in order to avoid the problems of respondent self-selection into or out of a contentious environment.

Interest in the genetic basis of negative affectivity has increased significantly in recent years. Over three dozen articles have been published in the last decade which have sought to find genetic polymorphisms associated with one or more of the measures that comprise the construct of negative affectivity. There have been two general approaches to finding these associations. The first is hypothesis-driven and relies on our current understanding of the neurochemical pathways associated with negative affectivity to identify genes that are theoretically linked to these traits, such as the 5HTTLPR (Hariri, 2009), BDNF (Chen et al., 2006), and COMT (Stein et al., 2005) genes. These hypothesized relationships can then be empirically tested, such as was done in Chap-

ter 4. The second approach is atheoretical and employs the tool of a Genome Wide Association Study (GWAS) to identify which SNPs, out of the hundreds of thousands of DNA base pairs genotyped, are most associated with a given trait. Because of the large number of tests run in GWAS analyses, it is standard to adjust the p -value to be very small in order to reduce the number of false positive associations. However, this simultaneously risks increasing the number of false negatives, which may contribute to the fact that GWAS results have been very hard to replicate.

Both of these approaches face serious challenges. A single SNP rarely accounts for more than 1% of the variance in a given trait (Gibson, 2010), even a trait that we know is under strong genetic influence, such as height (Visscher, 2008). The difficulty in finding genetic polymorphisms that account for the genetic variation between people in a trait has been called the "missing heritability" problem (Manolio et al., 2009) and is a major challenge to scholars interested in genetic association studies. A recent technique which has been used to address this problem is the creation of *genetic risk indices*. The creation of such an index increases our confidence that we are capturing the genetic underpinnings of a broader set of traits related to negative affectivity. By moving away from reliance on a single genetic variant, we may reduce the chance that we are picking up on a false positive association, or conversely drawing conclusions from a false negative relationship.

The second major contribution of this chapter is the reliance on an experimental framework. In addition to the results of Chapter 4, a handful of studies have begun to consider how individual differences interact with aspects of the environment to affect political attitudes (Hatemi, 2010; Settle et al., 2010) and political behavior (Mondak et al., 2010). As with much if not all observational work, these findings can be challenged by the possibility of endogeneity or selection. Genetic, personality and other psychological differences may lead us into our social and contextual environments (Scarr and McCartney, 1983), and this is most especially a problem for the proximate exposures—such as friendships, discussion partners, and other social interactions—that have formed the

basis for much of the interaction work so far. Thus, we cannot rule out the possibility that the genetic constructs that interact with the environment may lead a person to select into, or out of, those same environments. To make a stronger causal inference, we require an exogenously generated manipulation of the level of contention in a political environment.

Endogeneity is not a unique challenge to genepolitics, however, and political scientists have increasingly utilized field experiments to tackle the problem. Field experiments have found evidence that turnout can be increased through the provision of information (Nickerson, Friedrichs and King, 2006), or through appeals to civic duty (Gerber and Green, 1999) or social pressure (Gerber, Green and Larimer, 2008, 2010; Panagopoulos, 2010). Prior research lacks a convincing field experimental demonstration of the role of salient political competition itself on political participation, even though the theoretical reasoning for the relationship has been long articulated (Riker and Ordeshook, 1968; Cox and Munger, 1989; Blais, 2000; Blais and Carty, 1990; Jackman, 1987). In this paper, we design a field experiment in which we employ a postcard mobilization treatment meant to induce an emotional response to the degree of competition in an election. This approach allows us to more cleanly test the interaction between an individual's innate predispositions toward negative affectivity and an *exogenous* influence of exposure to political competition.

Synthesizing the research on emotions in politics with the literature in psychology on the effects of trait-level negative affectivity, we make two hypotheses about the way that genetic risk toward negative affectivity should affect voter turnout.

H1: Increased genetic risk for negative affectivity reduces the likelihood of turning out to vote.

The experience of anxiety induced by social interactions can condition responses to events precipitating future social interactions, and this conditioned sensitivity to potentially threatening social cues varies considerably among individuals (Hariri, 2009). Neurotic individuals are more likely to become anxious in the face of threats (Carver, Sutton and Scheier, 2000; Carver

and White, 1994; Elliot and Thrash, 2002), and neurotic people have stronger and more prolonged skin conductance reactivity to emotionally evocative stimuli than do people who score low on a neuroticism scale (Norris, Larsen and Cacciopo, 2007). One explanation for decreased political participation among those who score highly on measures of negative affectivity is that anxious people will try to avoid situations that are anxiety-inducing in order to reduce their arousal (Rusting and Larsen, 1995). Therefore, if they perceive that participating in politics is stressful, it is likely that people sensitive to threat may withdraw from the political sphere.

H2: Individuals with a greater (lower) risk for negative affectivity will be more (less) likely to abstain from voting as political contention increases.

Affective Intelligence Theory and the subsequent empirical work it spawned suggest that induced emotion can affect political behavior (Civettini and Redlawsk, 2009; Brader, 2005, 2006; Valentino et al., 2011; Valentino, Gregorowicz and Groenendyk, 2009; Valentino et al., 2008b). For people who are already predisposed toward heightened emotional activation, triggering them to think about an election may have the effect of heightening their emotional response, relative to those people who are more emotionally stable. If the treatment activates negative emotions, these individuals may seek to reduce this effect by disengaging with politics. Accordingly, we expect negative affectivity risk to depress turnout among our treatment group. Those without a genetic predisposition towards negative affectivity should, by contrast, be mobilized by political contention.

Measuring Negative Affectivity

Instead of testing individual SNPs, we create a genetic risk index for negative affectivity. We follow the process outlined in Belsky et al. (2011). Briefly, we conduct a literature search to identify all genetic variants that have been associated with our traits of interest in a GWAS study, a total of 120

SNPs. We then identify all SNPs that are in high linkage disequilibrium at .90 or higher (i.e. highly correlated) with those 120 SNPs of interest. From this expanded list, we create "bins" of highly correlated SNPs. From each bin, we select one SNP which has been typed in our sample, selecting preferentially for the original SNPs that have been found to be previously correlated with our traits. If the original SNP has not been typed in our sample, we randomly choose one of the other SNPs that is highly correlated with it. We are left with an additive index of 14 SNPs, where each respondent can have 0, 1 or 2 copies of the risk allele for each SNP, resulting in an index with values of 0-28. In our sample, however, the index takes on a range of 0-13. The list of these SNPs can be found in the Appendix, Tables 5.4 and 5.5.

As a robustness check, we created a less restrictive index measure. In this second index, we again start with the original set of 120 previously associated SNPs, but then add any SNPs that were in linkage disequilibrium at .75 or higher. Creating bins from this expanded list results in a list of 86 SNPs that could potentially be on our genotyping chip; 42 of these SNPs were actually found in our sample and these were used to make a second additive index. As we show later, our results are robust across both measures.

Sample

The overall universe from which the pool of subjects included in our field experiment was extracted included approximately 1,100 California residents.¹ This data was previously collected by researchers at the UCSD School of Medicine. Participants were recruited from southern California by access to a population birth record-based twin registry (Cockburn et al., 2002) as well as by newspaper advertisement (Zhang et al., 2004). The protocol was approved by the University of California San Diego Institutional Review Board, and each subject gave written informed consent for participation in the Twin and Family Study run by Daniel O'Connor and his colleagues.

¹For a detailed description of the original sample, see Zhang et al. (2004).

To create the sampling frame for the field experiment we checked all addresses using the United States Postal Service's Mail Update procedure. We removed all people with undeliverable addresses and those who no longer resided in California. We identified a total of 761 individuals from the original sample who were listed in the April 2009 California State Registrar of Voters file. We then randomly assigned a subset of these respondents to receive the treatment, a total of 380 people. Using a combination of full name, birthday, address information, and phone number we were able to match all 761 people in the sample in the voter file after the November 2010 election in order to determine whether each person had voted.

Balance tests on the treatment and control groups reveal no major differences in demographics or genetic information (Table 5.1). To control for genetic background heterogeneity in all regressions, we performed a multidimensional scaling analysis (MDS) using PLINK (Purcell et al., 2007) including all autosomal SNPs available in the data. We then included the top MDS dimension as a covariate in the association analyses (Wang et al., 2009). In the sampling frame, 237 subjects in the treatment group and 232 in the control group subjects were previously genotyped on 592,312 SNPs using the Illumina 610 Quad genotyping array. Genetic risk scores were calculated for all subjects for whom we had complete information for all SNPs in the index.²

²For MZ twin pairs, only one individual was genotyped and the information was used for both twins. Standard GWAS quality control measures were applied using plink v1.0.7 leaving 559,400 genotyped SNPs.

Table 5.1: Balance tests for treatment and control groups. P-values indicate whether or not the control and treatment groups are significantly different on the characteristic of interest.

	Mean/Prop	SD	Min	Max	N	p-value
Treatment Group					380	
Voted (Nov. 2008)	0.88	0.32	0.00	1.00	380	0.25
Age	51.70	17.50	20.00	98.00	376	0.59
Male	0.29	0.46	0.00	1.00	293	0.59
MDS Ethnicity	-0.00	0.02	-0.02	0.10	225	0.40
Genetic Index 1	4.95	2.35	0.00	13.00	225	0.26
Genetic Index 2	20.13	6.66	5.00	42.00	221	0.83
Control Group					381	
Voted (Nov. 2008)	0.91	0.29	0.00	1.00	378	0.25
Age	52.39	17.77	20.00	98.00	378	0.59
Male	0.31	0.47	0.00	1.00	290	0.59
MDS Ethnicity	0.00	0.03	-0.02	0.11	216	0.40
Genetic Index 1	5.20	2.27	1.00	13.00	216	0.26
Genetic Index 2	20.27	6.66	4.00	39.00	215	0.83

Treatment

Subjects assigned to the treatment group were mailed the postcard shown in Figure 5.1 on October 20, 2010, ensuring that they received it within the week prior to Election Day. The purpose of our treatment was to heighten subjects' awareness of the degree of contention in the upcoming races. None of the mailed cards were returned as undeliverable. This is typical for a mailing with addresses that have been validated and a subject pool that has been previously contacted. While we believe this suggests all subjects assigned to the treatment condition were successfully treated, we acknowledge that it is conceivable that some subjects failed to be treated. Thus, we report intent-to-treat effects in the analyses that follow, noting that these are the conservative estimates of the treatment effects we detect. Taking contact rates into account would only magnify the estimated treatment effects (Angrist, Imbens and Rubin, 1989).

We note three features about this treatment. First, it does clearly prime contention by noting the likelihood of close races, using idioms such as 'up for grabs', 'a toss up', and 'intense'. Second, it clearly identifies the action which voters should take to address the contention, namely voting. Third, the flyer is non-partisan and contains substantial source credibility. The flyer clearly indicates that it was sent by the 'UCSD Politics Survey,' for which recipients had completed a long survey in the months prior and had been compensated for their participation. Accordingly, we have good reason to argue that subjects would believe the content of this treatment to be true. To ensure the desired effects of the treatment, we performed two manipulation checks.

Our first manipulation check was conducted on a sample of 135 UCSD undergraduates in a conventional subject pool. The results of this check suggest the treatment did elicit an emotional reaction from respondents. Subjects were shown the mailer and asked "How does the mailer make you feel?" with three sliders next to the words "Anxious", "Angry", and "Enthusiastic." Respondents could move the sliders from 0 ("Not at All") to 5 ("Very") for each emotion, and could mark that the mailer made them feel more than one emotion.

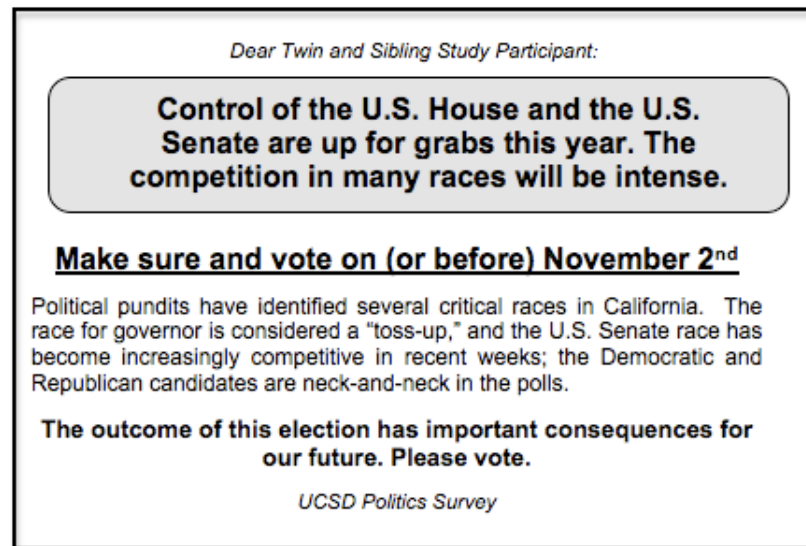


Figure 5.1: Treatment Mailer

Approximately 86% of the sample reported being anxious, 91% of the sample reported being enthusiastic, and 32% of the sample reported being angry in response to viewing the mailer.

In order to contextualize the emotional response to the mailer, respondents were asked to similarly rate a set of stimuli that probed their predicted reactions to being exposed to variety of political experiences. Figure 5.2 shows the weighted proportions of each emotion for the mailer (in red) in comparison to a set of stimuli which respondents also rated (in shades of blue). The mailer elicits less anger than every other stimuli except participating in a political discussion with people who share the respondent's opinions; elicits about the same amount of anxiety as reading a poll showing that the opposition is leading or being a partisan minority in their community; and elicits the same level of enthusiasm as watching a political debate on TV.

Our second manipulation check deployed Amazon's Mechanical Turk to field a brief survey in which respondents were exposed to one of three versions of a key item. Surveys were completed in September 2011. The key manipulation in the survey was to randomly vary the contents of one survey item. In

one condition, subjects were presented with a stimulus that was nearly identical to the message we included in our experimental mailing. Subjects were told the following: "As you may know, next year is an election year. Control of the U.S. House and the U.S. Senate will be up for grabs. The competition in many races will be intense. Political pundits have identified several critical races in your state. Congressional races have become increasingly competitive in recent weeks; the Democratic and Republican candidates are neck-and-neck in the polls. The outcome of this election has important consequences for our future."

The second version of the stimulus was designed to serve as a pure control condition. Subjects were exposed to a generic message about the upcoming (2012) elections that did not include any cues about levels of competitiveness. Subjects were told simply: "As you may know, next year is an election year. Voters will vote for president and members of Congress in federal elections. Some states will also have gubernatorial elections."

We also included a third message about a topic entirely unrelated to the elections (recycling) as a placebo treatment. The placebo message read as follows: "As you may know, recycling turns materials that would otherwise become waste into valuable resources. Recycling saves energy, prevents pollution and helps sustain the environment for future generations. Recycling has important consequences for our future."

All respondents were then asked to report the degree to which the message they were randomly exposed to made them feel "anxiety" using a nine-point scale on which 0 indicates respondents "would not feel this emotion at all" and 8 signified they "would feel this emotion very strongly." Overall, we hypothesized that the message sensitizing subjects to the closeness of the upcoming elections would heighten anxiety levels. Therefore, we expected reported anxiety to be significantly higher in the closeness condition compared to either of the other two treatments. We obtained valid responses for the key survey item of interest from 187 unique respondents: 61 were exposed to the closeness message, 49 to the recycling condition and 77 to the generic

control message. All surveys included standard demographic questions (age, race, gender, party identification, and an item used to probe political knowledge). A randomization check confirms background characteristics between respondents in the three versions of the treatment are balanced. An F-test of significance for a regression in which assignment to the survey version is regressed on gender, age, race, party identification and political knowledge is insignificant ($F(13, 170) = 1.01, p = .45$).

As expected, we find that respondents exposed to the version of the survey that indicated the upcoming election was anticipated to be close reported feeling significantly higher levels of anxiety on average ($M_{close} = 4.80$) compared to both the placebo condition about recycling ($M_{placebo} = 3.84; p < .05$) as well as to the pure control condition ($M_{control} = 3.69; p < .01$). The difference in mean levels of reported anxiety between the placebo and the pure control conditions is statistically insignificant ($p = .75$). We conclude from these results that emphasizing the closeness of an upcoming election can successfully induce anxiety compared to more generic messages about the election that exclude competitiveness cues. These findings suggest the manipulation deployed in our field experiment likely induced anxiety.

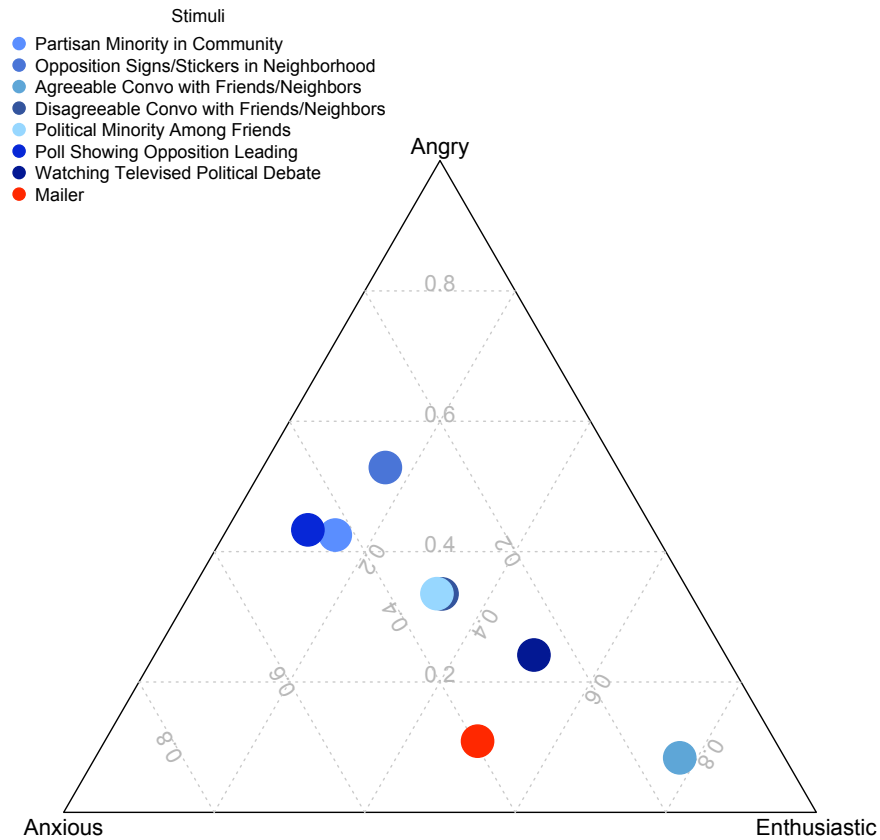


Figure 5.2: The weighted proportion of total emotional expression for mailer compared to other political stimuli. For each stimulus, respondents' scores (0-5) were summed for each emotion. Proportions were then calculated by dividing the emotion sum by the total amount of emotion expressed for the stimulus. Points are positioned in the grid based on this calculation.

Results

Our analysis begins by examining whether genetic risk is directly related to the probability of turning out to vote. According to our first hypothesis, those with a greater genetic risk for negative affectivity should be less likely to participate. As a first step, we consider the effects of genetic risk in the absence of the treatment by examining only those respondents in the control condition. As Table 5.2 shows, there is no apparent direct effect of negative affectivity on turnout. Given the very small estimated effects, this is likely not a function of reduced statistical power.

We next check for a main effect of the treatment, which we take to be a test of the general argument that greater political contention leads to higher turnout. There is no apparent main effect of the treatment. Seventy percent of subjects assigned to receive the mailer voted, compared to 69.1% who voted in the control condition.³ To confirm this comparison of means, we also performed a logistic regression of turnout on treatment condition controlling for age, gender, ethnicity, and prior voting in the November 2008 election. This is reported in the first column ("Base Model") of Table 5.3. The results suggest no main effect for the treatment.

Given our limited sample size, as well as the relatively high salience of the election, we did not anticipate that our mailer would necessarily have a direct effect. Furthermore, our theory argues for heterogeneity in the treatment response, based on levels of negative affectivity. Pooling all respondents together within each treatment group may wash out any treatment effects. We therefore turn to analyzing whether the mailer was more influential for those who score high on our negative affectivity risk index. This affords us a clear test of our second hypothesis, namely that the treatment should decrease turnout among those with a higher genetic risk for negative affectivity, while increasing

³We note the overall turnout rate for subjects in the control condition was slightly higher, although comparable, to the overall proportion of registered voters in California (60%) who turned out to vote in the November 2010 elections.

Table 5.2: No direct effects of genetic risk on voting in absence of treatment. Robust standard errors in parentheses and [†] significant at $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$ for a two-tailed test.

	Model 1	Model 2
(Intercept)	-2.57*** (0.80)	-2.20** (0.91)
Genetic Risk Score 1	0.01 (0.08)	
Genetic Risk Score 2		-0.02 (0.03)
Male	-0.44 (0.40)	-0.42 (0.41)
Age	0.03** (0.01)	0.03** (0.01)
MDS1	1.07 (7.04)	1.94 (6.75)
Vote Nov. '08	2.40*** (0.61)	2.43*** (0.62)
N	216	215
Robust standard errors in parentheses		
* indicates significance at $p < 0.05$		

it among those subjects absent this risk.

Table 5.3 presents our results. The effects in columns 2 and 4 (the models without an interaction term) suggest that genetic risk scores for negative affectivity decrease the probability of turnout, although these effects do not reach conventional levels of significance for Genetic Risk Index 1. This provides some qualified support for our first hypothesis, namely that those with more negative affectivity risk are more likely to disengage from politics.⁴

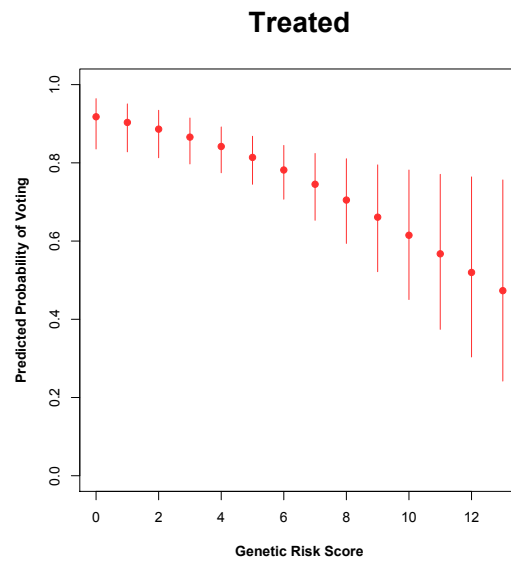
This finding changes when we moderate the effect of the treatment through genetic risk score. The interaction terms in Table 5.3 are both negative: the interaction term with Genetic Risk Score 1 is significant at the $p < .05$

⁴Results of all models without control covariates included are substantively similar to the results reported and are available from the authors by request

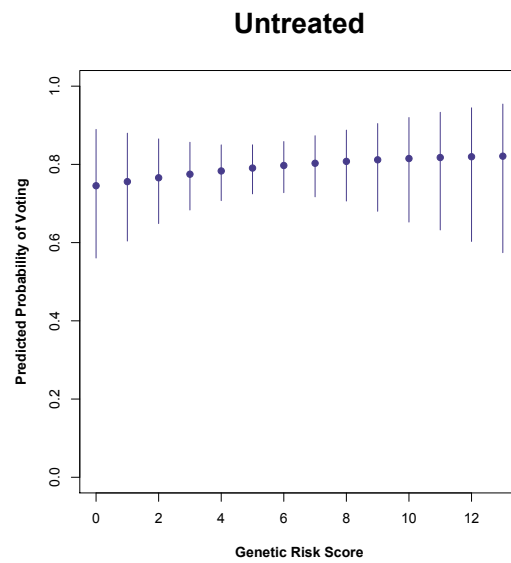
Table 5.3: Each column shows the results of a separate logistic regression. Dependent variable is coded 1 if subject voted in the November 2010 election in California, 0 otherwise. Robust standard errors in parentheses. All models include covariates for gender, age, ethnicity, and prior voting in the November 2008 election (not shown—available from the authors by request). GR1 refers to "Genetic Risk Score 1"; GR2 refers to "Genetic Risk Score 2" (see text for details). [†] indicates significance at $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$ using two-tailed tests.

	Base Model	Genetic Risk Score 1		Genetic Risk Score 2	
		<i>Excludes</i>	<i>Includes</i>	<i>Excludes</i>	<i>Includes</i>
		<i>Interaction</i>	<i>Interaction</i>	<i>Interaction</i>	<i>Interaction</i>
Treatment	0.10 (0.24)	0.08 (0.25)	1.12 * (0.54)	0.10 (0.25)	1.08 [†] (0.76)
GR 1		-0.08 [†] (0.06)	0.02 (0.08)		
Treatment*GR 1			-0.20 * (0.09)		
GR 2				-0.03 * (0.02)	-0.01 (0.03)
Treatment*GR 2					-0.05 [†] (0.03)
N	441	441	441	436	436

level and that with Genetic Risk Score 2 is significant at the $p < .10$ level. As Figure 5.3(a) demonstrates, treatment effects are negative for those with increasing levels of genetic risk. This confirms our proposition that those with greater genetic risk will be less likely to vote in the face of increased contention. Comparing the point estimate for those with no genetic risk in the left pane to those with no genetic risk in the right pane confirms the second part of our claim. Namely, those with no genetic risk will have an increased probability of casting a ballot in the face of great contention. Taken together, these results imply that there is significant heterogeneity in the treatment effects we detect. For voters low in genetic risk, exposure to political contention actually acts as a motivator, and increases their probability of turning out. However, as risk increases, sensitizing them to political contention decreases their probability of



(a) Treatment Group



(b) Control Group

Figure 5.3: Points show predicted probabilities of voting for respondents in the treatment group and control group for each value of Genetic Risk Index 1, using the interaction model. Lines represent 95% confidence intervals.

voting below what is expected for subjects in the control condition.

We note that our treatment exercises a substantively impressive influ-

ence over the probability of voting for those who have high genetic risk scores. Indeed, among those with the lowest scores, the probability of voting when in treatment is nearly 90%, while it is below 80% for the same individuals in control. However, as genetic risk increases, the likelihood of voting when in treatment begins to decline precipitously, eventually falling below 50%. Political contention simply does not have the same effect (or even direction of effect) for all voters, but it does have impressively large effects, in different directions, among different voters.

Discussion and Conclusion

Competitive politics, thought to be a central motivation for participation, also hold out the potential to trigger negative emotions such as anxiety. We should expect those who react negatively to such emotions to disengage from politics and expect those who react positively to further engage. In sum, our results support an understanding of electoral politics in which competition has contradictory effects and in which these effects are conditional upon individual differences.

Our results demonstrate that a genetic risk for negative affectivity may not in and of itself disincline a person to participate politically. However, this predisposition and its associated traits do heighten a person's sensitivity to their political environment. This heterogeneity in response to political competition suggests that we more deeply consider the merits of various mobilization tactics, including voter registration drives and efforts to increase turnout. These heterogeneous effects recommend a more careful consideration of contextual effects in the study of personality and political behavior. More broadly, they suggest caution to those forwarding theories of emotional reactions to politics (eg Marcus, Neuman and Mackuen, 2000) which assume unidirectional or homogenous effects. Individuals vary, perhaps deeply. Such variance conditions how they experience the political world.

In addition to our finding of heterogeneity, we note two further inno-

vations of this paper. It is the first paper to our knowledge to implement an exogenous, field experimental treatment on a genetically informative sample. Indeed, to our knowledge this is among the first field experiments run in behavior genetics generally, though behavioral geneticists have recognized the value of the experimental approach (van IJzendoorn et al., 2011). We thus harness the inferential advantages of field experiments to test hypotheses that could be subject to confounds in a merely observational study. We should note that it is common for medical researchers to maintain large panels of respondents with large amounts of individual-level biological and psychological data. Researchers can look to these panels for opportunities to run biologically informed field experiments like ours. Second, in contrast to early genopolitics studies that have relied on single genetic variants, we have constructed a genetic risk index. Such indices include a substantially larger amount of information about an individual's susceptibility to some trait, and as such allow us to better guard against chance findings. This innovation can likewise be put in practice by other researchers.

Our work has some limitations. First, our genetic risk index is derived from a broad concept of negative affectivity that incorporates many different clinical definitions and measurements of anxiety and neuroticism susceptibility. Future work would benefit from more refined hypotheses about what specific aspects of a disposition toward anxiety or neuroticism are most strongly theoretically and empirically related with turnout. Second, replication will be important to address whether these results are generalizable. Experiments in a laboratory setting might offer additional leverage in understanding how individual traits interact with experimental stimuli. Third, our results are derived from a relatively limited sample. Larger, more diverse samples should be employed in the future.

The experimental revolution in mobilization offers compelling evidence that people can respond dynamically to their environments. Our results demonstrate the potential of incorporating genetic measures of individual differences into an experimental framework. Studying average relationships between a

treatment and a behavioral outcome misses the point that our emotional, cognitive, and behavioral responses are heavily dependent on biological predispositions. Understanding why individuals respond differently to the same stimuli offers the potential of understanding when contention will increase turnout and when it can be expected to decrease it. By taking individual differences seriously, we can better understand how different individuals experience their political environment.

The previous chapter demonstrates the importance of the interaction between a person's innate stress sensitivity and the level of political threat in the environment. Modeling heterogeneity in innate individual differences into our understanding of the role of political competition better elucidates the multifaceted effects of the environmental variable. We shouldn't lose sight of the fact that modeling heterogeneity in the environment can aid our understanding of the role of innate, individual differences, as well. For example, past work studying the relationship between neuroticism and political behavior has contradictory findings, casting doubt over the role of traits related to negative affectivity in political behavior. The approach we take in theorizing and testing the role of varying degrees of political competition can clarify the role of individual differences. The political consequences of negative affectivity and other traits are likely conditional on the political environment, so studies which model individual differences without incorporating environmental effects may be inconclusive and potentially contradictory depending on the context in which the study was conducted.

The analysis presented in this chapter is currently under review for publication: Settle, Jaime, Christopher T. Dawes, Peter J. Loewen, and Costas Panagopoulos, "Negative Affectivity, Political Contention and Turnout: A Genopolitics Field Experiment." I was the primary researcher on this paper and was responsible for designing and executing the treatment, analyzing the data, and writing the manuscript.

Appendix

Because of the rapid growth in the field of genome wide association studies, there is no single, comprehensive updated database that compiles the results of associations for traits related to negative affectivity. Scientists interested in translating genome-wide association study (GWAS) findings into clinical or more context-dependent follow-up research have recently moved toward developing techniques that incorporate public-access web-based resources that contain information about inheritance patterns of SNPs to make more meaningful measures of the underlying genetic susceptibility to traits or diseases such as obesity (Belsky et al., 2011). In brief, linkage disequilibrium (LD) is the concept that alleles at two or more loci (locations on a chromosome) may be more likely to occur together than we would expect at random. Alleles of SNPs that are in high LD with each other are very likely to co-occur, so if you know what nucleotide a person has at one SNP locus, you can know with a high degree of certainty what nucleotide they are likely to have at a locus in high LD with the first. Using this principle, it is possible to identify blocks of SNPs that are correlated with a SNP of interest, which can then be used in a systematic way to derive a genetic risk index.

For a detailed review of the process we used applied to another phenotype (obesity), see Belsky et al. (2011). Our literature search identified approximately 300 SNPs that have been identified as candidates for an association with a negative affectivity subtrait in either a candidate association study or a GWAS study. To identify which of those associations merited inclusion in a genetic risk index, we used the principle of linkage disequilibrium to identify those SNPs which tend to be inherited together, selecting a single SNP from each of these "bins" to be represented in the index. We identified 120 SNPs that had been found to be significantly associated with a facet of negative affectivity at a level higher than 10^{-5} in a GWAS study. These SNPs, and the genes and behaviors with which they have been associated, are shown in Table 5.4. We then used the Seattle GVS Database to identify SNPs that were in LD of .95 or higher with the 120 SNPs of interest, and then narrowed that combined list to

the SNPS that are typed on the chip used to genotype our sample. This resulted in a set of 53 SNPs. These 53 SNPs could be grouped into 14 "bins" of SNPs where the SNPs in each bin were in high LD with each other: each bin had one or more "seed" SNP that was in perfect LD with every other seed SNP and all proxy SNPs in the bin. Proxy SNPs in the bin were in LD at .95 or higher with all seed SNPs but not necessarily with the other proxy SNPs. We then selected one SNP from each bin, selecting preferentially for one of the seed SNPs, and then created an additive index of these 14 SNPs. Each respondent had 0, 1 or 2 copies of the risk allele for each SNP, which results in an index with values of 0-28. In our sample, however, the index takes on a range of 0-13.

Table 5.4: SNPs related to negative affectivity. Predicted association acronyms are as follows: NEO is the 240 question Revised NEO Personality Inventory; NEOFFI is the NEO Five Factor Inventory; EPQ is the Neuroticism dimension of the Eysenck Personality Questionnaire; Cloninger HA is the Harm Avoidance Scale of the Cloninger Tridimensional Personality Questionnaire. Table continued on next page.

	rsID	Predicted Associations	Alleles	Minor Allele	Percent Allele Freq.	Genes	base_NCBI_36	SigLevel	Sample	Cites
1	rs10265025	NEO ; subscales	A/G	A	34.30	none	7-67009664	5.86E-04	US main sample, German replication	van den Oord et al 2008
2	rs1043372	EPQ	C/T	C	34.80	ARRDC4	15-96317137	5.68E-06	CoLaus	Calboli et al. 2010
3	rs1043374	EPQ	A/C	A	35.20	ARRDC4	15-96317626	5.75E-06	CoLaus	Calboli et al. 2010
4	rs10448113	NEOFFI	C/G	C	25.00	none	8-5540684	4.30E-06	European Descent	de Moor et al. 2010
5	rs10483573	EPQ	G/C	G	25.00	none	14-46932227	5.60E-05	Southwest England	Shifman et al 2008
6	rs10490747	Cloninger HA	A/C	A	31.10	DYTN	2-207280641	1.70E-05	Australian twins and families	Verweij et al. 2010
7	rs10495388	NEOFFI	C/A	C	3.30	none	1-235159732	8.00E-06	European Descent	de Moor et al. 2010
8	rs10495711	NEO ; subscales	T/C	T	25.00	none	2-20923411	1.76E-04	US main sample, German replication	van den Oord et al 2008
9	rs10502247	NEO ; subscales	T/C	T	26.10	TECTA	11-120504152	3.38E-05	US main sample, German replication	van den Oord et al 2008
10	rs10504830	EPQ	G/A	G	9.10	CNBD1	8-88448321	1.10E-04	Southwest England	Shifman et al 2008
11	rs10797812	EPQ	G/A	G	45.90	none	1-181251220	2.40E-04	Southwest England	Shifman et al 2008
12	rs10847832	Anxiety severity	A/G	A	47.00	TMEM132D	12-128378049	P = 0.0007	German Samples (3)	Erhardt et al. 2010
13	rs10866995	NEOFFI	A/T	A	25.00	none	8-5541205	4.40E-06	European Descent	de Moor et al. 2010
14	rs11060369	Panic disorder	C/A	C	37.40	TMEM132D	12-128526150	7.63E-06	German Samples (3)	Erhardt et al. 2010
15	rs11132986	Cloninger HA	T/C	T	28.90	none	4-174608356	2.00E-05	Australian twins and families	Verweij et al. 2010
16	rs11137594	NEOFFI	G/A	G	26.40	PSAT1	9-80112137	5.10E-06	European Descent	de Moor et al. 2010
17	rs1159275		G/T	G	15.70	none	1-193915865	8.67E-06	Sardinian main sample, US and Netherlands replication	Terracciano et al. (2010)
18	rs11703744	NEOFFI	A/G	A	22.60	none	22-16926667	5.30E-06	European Descent	de Moor et al. 2010
19	rs11707952	NEOFFI	G/A	G	39.40	none	3-160147919	8.70E-06	European Descent	de Moor et al. 2010
20	rs11744339	Cloninger HA	G/A	G	11.30	PPP2R2B	5-145958274	3.30E-05	Australian twins and families	Verweij et al. 2010
21	rs11780799	Cloninger HA	A/G	A	44.20	NCALD	8-103117363	1.10E-05	Australian twins and families	Verweij et al. 2010
22	rs12068674	NEOFFI	C/T	C	3.30	none	1-235143986	6.70E-06	European Descent	de Moor et al. 2010
23	rs12204812	EPQ	A/C	A	33.50	NKAIN2	6-124723202	6.43E-06	CoLaus	Calboli et al. 2010
24	rs12256421	NEOFFI	A/G	A	42.50	none	10-17654103	7.10E-06	European Descent	de Moor et al. 2010
25	rs12330727	Cloninger HA	C/T	C	10.90	none	3-102316438	2.50E-05	Australian twins and families	Verweij et al. 2010
26	rs12466450	Panic disorder	T/C	T	16.50	CRIM1	2-36474457	P = .0001, .008	German Samples (3)	Erhardt et al. 2010
27	rs12509930	NEOFFI	G/A	G	30.90	SHROOM3	4-77714595	8.30E-06	European Descent	de Moor et al. 2010
28	rs12513013	NEOFFI	C/T	C	30.90	SHROOM3	4-77717260	9.70E-06	European Descent	de Moor et al. 2010
29	rs12883384	NEO ; subscales	A/C	A	36.10	MDGA2	14-46473434	2.35E-05	US main sample, German replication	van den Oord et al 2008
30	rs13270320	NEOFFI	A/G	A	6.70	none	8-127907991	9.90E-06	European Descent	de Moor et al. 2010
31	rs13290746	EPQ	C/T	C	18.70	LOC100128556	9-34858377	1.50E-04	Southwest England	Shifman et al 2008
32	rs1452788	EPQ	G/A	G	29.60	TCF4	18-51268302	6.50E-03	Southwest England	Shifman et al 2008
33	rs1516952	NEOFFI	T/C	T	5.20	none	8-128007941	5.30E-06	European Descent	de Moor et al. 2010
34	rs16834552	NEOFFI	T/C	T	3.30	none	1-235146315	6.60E-06	European Descent	de Moor et al. 2010
35	rs17008522	Cloninger HA	G/C	G	30.90	none	4-125872117	4.90E-05	Australian twins and families	Verweij et al. 2010
36	rs17057051	Cloninger HA	G/A	G	29.60	PTK2B	8-27283471	2.00E-05	Australian twins and families	Verweij et al. 2010
37	rs17363064	NEOFFI	A/G	A	24.60	none	8-5540259	5.80E-06	European Descent	de Moor et al. 2010
38	rs17385253	EPQ	C/T	C	22.20	none	1-34667596	3.30E-05	Southwest England	Shifman et al 2008
39	rs17453815	NEOFFI	G/A	G	24.20	none	8-5537027	6.60E-06	European Descent	de Moor et al. 2010
40	rs17453906	NEOFFI	C/G	C	24.20	none	8-5540233	5.70E-06	European Descent	de Moor et al. 2010

Continued on next page

Table 5.4: (continued) SNPs related to negative affectivity. Table continued on next page.

	rsID	Predicted Associations	Alleles	Minor Allele	Percent Allele Freq.	Genes	base_NCBI_36	SigLevel	Sample	Cites
41	rs17513400	NEOFFI	G/A	G	11.30	BCAS3	17-56684750	8.00E-06	European Descent	de Moor et al. 2010
42	rs17837764	NEO ; subscales	A/G	A	11.10	LOC393078	7-156946444	2.26E-05	US main sample, German replication	van den Oord et al 2008
43	rs1849710		G/C	G	15.30	TMEM16D	12-100046209	2.29E-05	Sardinian main sample, US and Netherlands replication	Terracciano et al. (2010)
44	rs1877332	NEO ; subscales	C/T	C	7.40	none	8-138950317	5.29E-05	US main sample, German replication	van den Oord et al 2008
45	rs1923380	Cloninger HA	G/A	G	24.80	none	6-165411541	3.80E-05	Australian twins and families	Verweij et al. 2010
46	rs1959813	NEO ; subscales	C/T	C	36.10	MDGA2	14-46465110	1.86E-05	US main sample, German replication	van den Oord et al 2008
47	rs201997	EPQ	G/C	G	37.40	ADAM18	8-39703325	6.40E-03	Southwest England	Shifman et al 2008
48	rs2025947	EPQ	C/T	C	10.00	GPC6	13-92773532	6.74E-07	CoLaus	Calboli et al. 2010
49	rs2039528		G/A	G	40.90	none	1-43733117	1.60E-05	Sardinian main sample, US and Netherlands replication	Terracciano et al. (2010)
50	rs2066331	NEO ; subscales	C/G	C	27.00	none	1-163284059	3.92E-05	US main sample, German replication	van den Oord et al 2008
51	rs2123315	EPQ	C/T	C	7.50	none	4-18575667	4.30E-04	Southwest England	Shifman et al 2008
52	rs2154257	NEOFFI	C/G	C	43.30	none	10-17667143	5.10E-06	European Descent	de Moor et al. 2010
53	rs2349775	NEO ; subscales	G/A	G	28.70	NXPH1	7-8684605	6.31E-05	US main sample, German replication	van den Oord et al 2008
54	rs2697318	NEO ; subscales	C/A	C	22.20	none	2-197801155	4.77E-05	US main sample, German replication	van den Oord et al 2008
55	rs2705287	NEO ; subscales	T/A	T	7.40	none	8-138989754	4.12E-05	US main sample, German replication	van den Oord et al 2008
56	rs2705293	NEO ; subscales	C/T	C	7.90	none	8-138988127	6.32E-05	US main sample, German replication	van den Oord et al 2008
57	rs296410	EPQ	C/T	C	46.10	PDE4D	5-58937990	p=.006	CoLaus	Calboli et al. 2010
58	rs3007105	NEO ; subscales	T/C	T	36.80	MDGA2	14-46437366	6.87E-05	US main sample, German replication	van den Oord et al 2008
59	rs322239	EPQ	C/A	C	13.00	PTN	7-136607147	4.80E-06	Southwest England	Shifman et al 2008
60	rs362584		A/G	A	26.50	SNAP25	20-10202475	5.00E-05	Sardinian; US and Netherlands	Terracciano et al. (2010)
61	rs3735196	NEO ; subscales	G/C	G	0.90	HIPK2	7-138935891	6.84E-05	US main sample, German replication	van den Oord et al 2008
62	rs3766110	NEO ; subscales	C/A	C	22.60	F5	1-167781807	1.57E-05	US main sample, German replication	van den Oord et al 2008
63	rs3814277	EPQ	G/C	G	11.30	GPC6	13-92777344	6.60E-07	CoLaus	Calboli et al. 2010
64	rs4006371	NEOFFI	T/C	T	3.30	none	1-235144280	6.70E-06	European Descent	de Moor et al. 2010
65	rs4006372	NEOFFI	T/C	T	3.90	none	1-235144438	6.60E-06	European Descent	de Moor et al. 2010
66	rs401897	EPQ	T/C	T	41.70	CASS4	20-54463165	5.60E-03	Southwest England	Shifman et al 2008
67	rs4656685	NEO ; subscales	T/C	T	27.00	F5	1-167750468	2.49E-04	US main sample, German replication	van den Oord et al 2008
68	rs4841017	EPQ	C/T	C	23.20	none	8-8614503	6.50E-06	Southwest England	Shifman et al 2008
69	rs4870993	NEOFFI	G/A	G	5.20	none	8-128000185	5.60E-06	European Descent	de Moor et al. 2010
70	rs4871753	NEOFFI	A/C	A	5.20	none	8-128000067	7.10E-06	European Descent	de Moor et al. 2010
71	rs4875610	EPQ	A/C	A	37.40	CSMD1	8-3165318	4.10E-04	Southwest England	Shifman et al 2008
72	rs4965121	EPQ	C/G	C	29.70	none	15-96319796	5.83E-06	CoLaus	Calboli et al. 2010
73	rs6047641		T/G	T	11.70	none	20-21739854	6.54E-06	Sardinian main sample, US and Netherlands replication	Terracciano et al. (2010)
74	rs619656	NEO ; subscales	G/A	G	17.80	none	3-29080655	2.81E-04	US main sample, German replication	van den Oord et al 2008
75	rs6486322	NEO ; subscales	T/C	T	5.70	PLEKHA7	11-16900496	2.13E-04	US main sample, German replication	van den Oord et al 2008
76	rs6601097	NEOFFI	C/A	C	35.30	RASGEF1C	5-179566373	8.40E-06	European Descent	de Moor et al. 2010
77	rs6661736	NEOFFI	C/G	C	3.30	none	1-235148826	7.00E-06	European Descent	de Moor et al. 2010
78	rs6686536	NEOFFI	T/C	T	3.30	none	1-235148467	6.90E-06	European Descent	de Moor et al. 2010
79	rs6698815	NEOFFI	G/A	G	3.30	none	1-235148415	6.80E-06	European Descent	de Moor et al. 2010
80	rs6701337	NEOFFI	C/T	C	2.60	none	1-235148350	2.10E-06	European Descent	de Moor et al. 2010

Continued on next page

Table 5.4: (continued) SNPs related to negative affectivity.

	rsID	Predicted Associations	Alleles	Minor Allele	Percent Allele Freq.	Genes	base_NCBI_36	SigLevel	Sample	Cites
81	rs6959265	NEO ; subscales	C/T	C	1.30	HIPK2	7-138920510	1.49E-05	US main sample, German replication	van den Oord et al 2008
82	rs6982207	NEOFFI	A/G	A	26.80	none	8-5539253	5.50E-06	European Descent	de Moor et al. 2010
83	rs6983692	NEOFFI	T/A	T	6.70	none	8-128000492	6.80E-06	European Descent	de Moor et al. 2010
84	rs6994270	NEO ; subscales	G/C	G	24.80	SAMD12	8-119417676	6.80E-05	US main sample, German replication	van den Oord et al 2008
85	rs7018865	NEOFFI	A/G	A	22.40	PSAT1	9-80112214	8.30E-06	European Descent	de Moor et al. 2010
86	rs702543	EPQ	T/C	T	49.60	PDE4D	5-58878531	8.2E-04; pooled, 2.0E-06	Southwest England	Shifman et al 2008
87	rs7151262	NEO ; subscales	C/G	C	36.10	MDGA2	14-46473927	2.88E-05	US main sample, German replication	van den Oord et al 2008
88	rs721022	Panic disorder	C/T	C	41.40	KPNA4	3-161705726	P=.00001, .007	German Samples (3)	Erhardt et al. 2010
89	rs7212729	NEOFFI	G/A	G	11.30	BCAS3	17-56678003	6.10E-06	European Descent	de Moor et al. 2010
90	rs7231234	Cloninger HA	T/C	T	21.70	none	18-57513498	3.50E-05	Australian twins and families	Verweij et al. 2010
91	rs7309727	Panic disorder	T/C	T	26.10	TMEM132D	12-128521312	1.36E-06; 5.1E-07	German Samples (3)	Erhardt et al. 2010
92	rs7329003		G/A	G	28.30	none	13-106571549	8.99E-06	Sardinian main sample, US and Netherlands replication	Terracciano et al. (2010)
93	rs736759	NEOFFI	A/G	A	3.90	none	1-235160463	5.80E-06	European Descent	de Moor et al. 2010
94	rs7411668	NEOFFI	T/C	T	3.90	none	1-235160320	5.70E-06	European Descent	de Moor et al. 2010
95	rs7548398	NEOFFI	G/A	G	3.90	none	1-235147625	4.90E-06	European Descent	de Moor et al. 2010
96	rs7594674	EPQ	G/A	G	30.90	none	2-67133464	2.60E-03	Southwest England	Shifman et al 2008
97	rs7617530	Panic disorder	A/G	A	30.90	FHIT	3-60560796	P=.0009, .007	German Samples (3)	Erhardt et al. 2010
98	rs7625694	Cloninger HA	T/A	T	23.70	CLDN16	3-191600184	2.70E-05	Australian twins and families	Verweij et al. 2010
99	rs7666238	EPQ	G/A	G	26.50	none	4-142315213	9.00E-04	Southwest England	Shifman et al 2008
100	rs7943517	NEO ; subscales	T/C	T	5.40	PLEKHA7	11-16904254	3.92E-04	US main sample, German replication	van den Oord et al 2008
101	rs8002366	EPQ	T/C	T	10.00	GPC6	13-92797945	6.68E-07	CoLaus	Calboli et al. 2010
102	rs873989	EPQ	C/T	C	15.20	DAB1	1-58329186	3.50E-03	Southwest England	Shifman et al 2008
103	rs879560	Anxiety severity	T/C	T	48.70	TMEM132D	12-128357449	P = 0.0006	German Samples (3)	Erhardt et al. 2010
104	rs885219	Cloninger HA	G/A	G	15.20	POMP	13-28144206	4.50E-05	Australian twins and families	Verweij et al. 2010
105	rs900256	Anxiety severity	T/C	T	47.80	TMEM132D	12-128352537	P = 0.0003	German Samples (3)	Erhardt et al. 2010
106	rs9297749	NEOFFI	C/G	C	5.70	none	8-127999278	8.30E-06	European Descent	de Moor et al. 2010
107	rs9301877	EPQ	A/G	A	11.80	GPC6	13-92819856	6.72E-07	CoLaus	Calboli et al. 2010
108	rs9329165	EPQ	G/A	G	23.90	none	8-8614052	3.80E-05	Southwest England	Shifman et al 2008
109	rs9332600	NEO ; subscales	T/C	T	26.50	F5	1-167779537	2.68E-04	US main sample, German replication	van den Oord et al 2008
110	rs9431663	EPQ	G/A	G	26.80	TRIM67	1-229380844	1.20E-03	Southwest England	Shifman et al 2008
111	rs944513	NEOFFI	G/T	G	23.90	PSAT1	9-80111266	8.50E-06	European Descent	de Moor et al. 2010
112	rs9491140	EPQ	T/C	T	33.50	NKAIN2	6-124732936	6.47E-06	CoLaus	Calboli et al. 2010
113	rs9491142	EPQ	A/G	A	33.50	NKAIN2	6-124734716	6.45E-06	CoLaus	Calboli et al. 2010
114	rs9544495	Cloninger HA	A/C	A	29.40	none	13-76895414	5.00E-05	Australian twins and families	Verweij et al. 2010
115	rs9561326	EPQ	T/C	T	10.90	GPC6	13-92805108	6.64E-07	CoLaus	Calboli et al. 2010
116	rs9561329	EPQ	G/A	G	11.00	GPC6	13-92809170	6.98E-07	CoLaus	Calboli et al. 2010
117	rs971718	Cloninger HA	C/T	C	4.30	none	17-13065774	3.80E-05	Australian twins and families	Verweij et al. 2010
118	rs974793	NEO ; subscales	T/C	T	26.30	none	1-167745278	2.65E-04	US main sample, German replication	van den Oord et al 2008
119	rs979148	NEO ; subscales	G/A	G	7.40	none	8-138952654	6.09E-05	US main sample, German replication	van den Oord et al 2008
120	rs9959800	EPQ	A/T	A	48.20	none	18-52115138	1.70E-04	Southwest England	Shifman et al 2008

Table 5.5: 14 SNPs selected for composition of genetic risk indices

	Seed	Proxy
1	rs9561322	rs3814277 rs9561326 rs9561329
2	rs7329539	rs8002366 rs9301877 rs2025947
3	rs7309727	rs7485201 rs10847881 rs1873727 rs10847887
4	rs7015430, rs4871753, rs4870993	rs6983692 rs1516952
5	rs7548398	rs7411668 rs736759 rs4006372 rs16834552 rs4006371 rs12068674 rs6698815 rs6686536 rs6661736 rs10495388
6	rs12204812, rs9491140, rs9491142	
7	rs4841017	rs885000 rs4840352
8	rs6047641	rs873137
9	rs17513400	rs7212729
10	rs12509930	rs12513013
11	rs944514	rs7018865 rs944513
12	rs1159275	rs10921877 rs1556455 rs10801443 rs12067706
13	rs7329003	rs1927745
14	rs13270320	rs16901732

Conclusion

This research has raised as many new questions as it has answered the original questions that served to motivate the dissertation. In this concluding section, I address what we know now that we didn't know before. I then elaborate how the present findings will influence the next steps in my own research agenda, as well as the larger impact that publications stemming from the dissertation could have on the field of political behavior.

Overview of Findings

I've found evidence in support of the four hypotheses articulated in the first chapter. First, using data both from the National Election Study and from Facebook, I've shown that people who live in more competitive states and congressional districts experience increased emotional response to politics. The Facebook study suggests an overall increase in emotional activation towards politics broadly as a result of living in a battleground state. The NES data suggests—at least for one type of salient political target in the environment, the presidential candidate—that the relationship between competition and emotion may be quite nuanced. Some people may become more polarized in their emotional evaluations, responding with more positive emotion to stimuli they are predisposed to like (their party's presidential candidate) and with more negative emotion to aversive stimuli (such as the opposition party's candidate). Others may show the reverse pattern and actually temper their affective evaluations. Partisanship is one predictor of these different emotional response patterns. However, it is possible that the differences that underlie

the two patterns may be more innate than a social identity such as partisanship. Alternatively, or perhaps complementarily, this difference might only be observed for explicitly partisan targets in the environment; the net effect to political targets broadly is an increase in emotional activation.

The Facebook data also suggest that those people who have become more emotionally engaged with politics are more likely to vote, and that emotional response mediates about 11% of the relationship between competition and self-reported vote. This relationship cannot be tested in the 2008 NES data because of the large over-report of the self-report measure of voting and the statistically insignificant relationship between competition and voting in the sample. However, it merits further exploration in other data sources.

The second half of the dissertation offers support for the idea that people who are susceptible to negative affectivity may be differentially responsive to their political environments in a way that discourages them from voting. However, the results in Chapter 4 suggest that the notion of a stressful political environment is multi-faceted. The other work in the dissertation focuses on the idea of political competition and asserts that politics is most salient and emotion-inducing in contexts where elections are competitive and the population is politically heterogeneous. Another way to conceptualize a stressful political environment, and one supported by the findings in the fourth chapter, is that it can also be stressful to be a *political minority* in a community. Even if elections are not particularly contentious, a person may experience politically relevant anxiety if he or she is out of step with the values and priorities of the majority of the community.

Remaining Questions and Next Steps

Despite evidence in support of the hypotheses, there are several remaining pieces of the puzzle. The work in this dissertation represents the start of a research agenda, not its conclusion. In the coming years, I hope to expand upon the work I've completed so far to fill in the remaining gaps in an

understanding of the relationships between competition, emotion, voting, and sensitivity to threat.

First, given the conflicting results presented in Chapter 4, I believe that my theoretical understanding of political contention in the environment needs to be further developed. I've used several proxies to measure the politically contentious aspects of the political environment, ranging from the relatively crude "battleground state" designation, to the partisan vote share differential in the state or congressional district, to the opposition party vote share in the county. None of these proxies provide clear evidence about which aspects of the political environment trigger an emotional reaction or affect the decision to vote. The fact that presidential voteshare differential at the congressional district level still affects emotional response among respondents living in non-competitive states suggests that we need to look beyond the campaign-related stimuli that have been previously tested. I am particularly interested in investigating the kinds of social interactions or social cues which may make people emotional about politics itself. Are people even aware of the political composition of their "community," a group larger than their immediate social network but smaller than their state or the nation as a whole? Does the perception of living in a politically contentious community affect emotional activation toward politics, or is it the objective cues available in the environment that trigger an emotional reaction? Is it more stressful to feel like an "outsider" or political minority in one's community, or to be exposed to high levels of political disagreement and competition? I hope to extend the first half of the dissertation into a book length project which explores emotional response to objective evaluations and subjective perceptions of political contention.

The second half of the dissertation is suggestive but not conclusive in whether differences in *emotional response* are partially or primarily responsible for the change in voting behavior of people susceptible to traits related to negative affectivity. While there are strong theoretical grounds for suspecting that negative affectives become more anxious in response to political contention, and that they disengage from politics because of this increased anxiety, this

mechanism is not actually tested in the dissertation.

Thoroughly addressing this mechanism will lead me into the lab. An exciting growth area in political science is the rise of psychophysiological measurement to establish relationships between physiological sensitivities and political attitudes and behaviors. Political scientists have demonstrated that individuals who are more physiologically responsive to positive and negative images are more likely to participate in politics (Gruszczyński et al., 2011). Physiological sensitivities to threat are associated with political attitudes (Oxley et al., 2008) and conservatives may be more attentive to angry or aversive stimuli (McLean et al., 2011; Dodd et al., 2011). Work outside of political science has used a variety of psychophysiological techniques to demonstrate genetic and psychological differences in activation to stimuli (Hariri, 2009; Norris, Larsen and Cacciopo, 2007; Rhodes et al., 2007). It is likely that these individual differences affect physiological sensitivity toward political stimuli as well.

I have secured funding to generate experimental data that will include information about all of the variables in my theory—political contention, emotional response, voter turnout, and threat sensitivity. In one series of studies, I hope to explore how differences in threat sensitivity affect the way that people respond to signals in their environment about the amount of political contention. I would hypothesize that those people who score highly on measures of negative affectivity will be more sensitive to information that they are in the minority or that the environment is conflictual, and be less inclined to cast a mock vote in a laboratory setting. The second series of studies will build on this to show differences in physiological sensitivity to the perception of political threat.

Contributions

I believe there are two overarching contributions of this dissertation which have the potential to inform scholars interested broadly in political behavior.

First, classic questions in the discipline merit reconsideration as new sources of data become available. The authors of *Voting* (Berelson, Lazarsfeld and McPhee, 1954) outlined over 200 generalizations about political behavior derived from their own work and a handful of other studies conducted in the 1940s and 1950s. What these postulations lack in nuance is compensated for in their breadth: nearly every major avenue of research in American political behavior stems in part from the observations made in these early papers. Improvements in data collection and analysis have rendered significant refinement of the original postulations, but it is astonishing how accurate many of these observations are despite the lack of sophistication used to analyze the data.

Despite many advancements in survey design and validity, ultimately survey questions are reliant on the hindsight self-reports of participants and panel data collection is expensive and difficult. There is almost always a trade-off between the number of respondents or questions included in the study, and the number of panel waves or geographic representation in the survey. In practice, this limitation has meant that we are often constrained to either studying nationally representative samples that preclude the study of representative sub-groups, or representative samples of smaller slices of the population that prevent generalization to national trends or patterns. As a consequence of these inherent limitations in data collection and interpretation, we rely on a series of temporal snapshots of voter's own evaluations of their attitudes and behavior to make inferences about a complicated and multi-faceted process. Data sources such as Facebook, Twitter, or blogs can offer a highly accurate picture of when and how people are talking about politics. These approaches, as part of the computational social science revolution, offer a new perspective in demonstrating the patterns of political behavior we have studied for decades and new traction on "squishy" problems (Strauch, 1975). We should be open to the idea that these new sources of data can be used to test both established theories but also to generate hypotheses about changes in political behavior due to the technological advancement in our daily lives and in the way we interact

with politics. The field has currently undertheorized the role of social media and technology in the way people engage with the political world, and we have not had a sustained conversation about how methodological approaches could evolve to address the scale of the data and the movement away from random, representative samples to the whole population.

The second contribution is the idea that exploring the interaction between individual differences and the political environment are a step forward both for those scholars interested in individual differences, but more importantly for those scholars interested in why and how our environment affects our beliefs, opinions and behaviors. The nascent field of genopolitics has received harsh criticism from those who fail to appreciate the contributions that this line of inquiry can have even for those scholars not directly interested in biological underpinnings of behavior. However, I argue that research which incorporates biological measurement of individual differences can aid our understanding of *how* the environment could matter, which may suggest new possibilities for important environmental contributions.

In this dissertation I've applied both standard and novel techniques and data to get at a question of fundamental importance. My hope is that embracing our identity as methodological pluralists—while contributing our unique strength in elucidating the cause and effect of the political world—will mean that political scientists take a leadership role in identifying the specific causal mechanisms that underlie the effects of individual biological and psychological differences on social outcomes. Incorporating biology into our study of political participation in order to test existing theories of how the environment shapes our behavior offers a promising way forward in expanding our understanding of the political world.

Bibliography

- Abecasis, G., L. Cardon and W. Cookson. 2000. "A General Test of Association for Quantitative Traits in Nuclear Families." *American Journal of Human Genetics* 66.
- Abelson, Robert, Donald Kinder, Mark Peters and Susan Fiske. 1982. "Affective and Semantic Components in Political Personal Perception." *Journal of Personality and Social Psychology* 42(4):619–630.
- Abramowitz, Alan I and Kyle L Saunders. 2008. "Is Polarization a Myth?" *The Journal of Politics* 70(02):542–555.
- Abrams, Samuel J and Morris P Fiorina. 2012. "'The Big Sort' That Wasn't: A Skeptical Reexamination." *PS: Political Science and Politics* 45(2):203–210.
- Alpers, G. W., A.J. Winzelberg, C. Classen, H. Roberts, P. Dev, C. Koopman and C.B. Taylor. 2005. "Evaluation of Computerized Text Analysis in an Internet Breast Cancer Support Group." *Computers in Human Behavior* 21:361–376.
- Angrist, J.D., G.W. Imbens and D.B. Rubin. 1989. "Identification of Causal Effects Using Instrumental Variables." *Journal of American Statistical Association* 91(434):444–455.
- Ansolabehere, Stephen and Shanto Iyengar. 1997. *Going Negative: How Attack Ads Shrink and Polarize the Electorate*. New York: The Free Press.
- Ashenfelter, O and S Kelley, Jr. 1975. "Determinants of Participation in Presidential Elections." *Journal of Law and Economics* 18(3):695–733.

- Baron, R.M. and D.A. Kenny. 1986. "The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations." *Journal of Personality and Social Psychology* 51(6):1173–82.
- Baum, Matthew A, Ann Crigler, Marion Just and Jesse Mills. 2010. "Emotions, the Horserace Metaphor and the 2008 Presidential Campaign." Paper presented at the annual meeting of the American Political Science Association, September 2-5, 2010.
- Bélanger, Paul and Munroe Eagles. 2007. "Partisan Cross-Pressure and Voter Turnout: The Influence of Micro and Macro Environments." *Social Science Quarterly* 88(3):850–867.
- Belsky, Daniel Walker, Karen Sugden, Benjamin Williams, Terrie E. Moffitt, Renate Houts, Jeannette McCarthy and Avshalom Caspi. 2011. "Development and Evaluation of a Genomic Risk Score for Obesity." UNC Working Paper.
- Belsky, Jay, C. Jonassaint, M. Pluess, M. Stanton, B. Brummett and R. Williams. 2009. "Vulnerability Genes or Plasticity Genes?" *Molecular Psychiatry* 14:746–754.
- Belsky, Jay, Marian J. Bakermans-Kranenburg and Marinus H. van IJzendoorn. 2007. "For Better and For Worse: Differential Susceptibility to Environmental Influences." *Current Directions in Psychological Science* 16(6):300–304.
- Berelson, Bernard, Paul F. Lazarsfeld and William N. McPhee. 1954. *Voting: A Study of Opinion Formation in a Presidential Campaign*. Chicago: University of Chicago Press.
- Bishop, Bill and Robert Cushing. 2008. The Big Sort: Migration, Community, and Politics in the United States of "Those People". In *Red, Blue and Purple America: The Future of Election Demographics*, ed. Ruy Teixeira. Brookings Institution pp. 50–78.
- Blais, A. 2000. *To Vote or Not Vote: The Merits and Limits of Rational Choice Theory*. University of Pittsburgh Press.

- Blais, Andre and R.K. Carty. 1990. "Does Proportional Representation Foster Voter Turnout?" *European Journal of Political Research* 18:167–181.
- Blais, Andre and Simon Labbe-St-Vincent. 2010. "Personality Traits, Political Attitudes, and the Propensity to Vote." Paper presented at the ECPR Joint Session on Personality and Turnout, Munster, Germany, March 2010.
- Bohanek, J. G., R. Fivush and E. Walker. 2005. "Memories of positive and negative emotional events." *Applied Cognitive Psychology* 19:51–66.
- Bond, Robert M., Christopher J. Fariss, Jason J. Jones, Adam D.I. Kramer, Cameron Marlow, Jaime E. Settle and James H. Fowler. 2011. "A Massive Scale Experiment in Social Influence and Political Mobilization." Paper presented at the 2011 Midwest Political Science Association annual meeting.
- Books, John and Charles Prysby. 1991. *Political Behavior and the Local Context*. Praeger.
- Boyce, W. Thomas and Bruce J. Ellis. 2005. "Biological Sensitivity to Context: I. An Evolutionary-Developmental Theory of the Origins and Functions of Stress Reactivity." *Development and Psychopathology* 17:271–301.
- Brader, Ted. 2005. "Striking a Responsive Chord: How Political Ads Motivate and Persuade Voters by Appealing to Emotions." *American Journal of Political Science* 49(2):388–405.
- Brader, Ted. 2006. *Campaigning for Hearts and Minds: How Emotional Appeals in Political Ads Work*. Chicago: University of Chicago Press.
- Brader, Ted and Bryce Corrigan. 2007. "How the Emotional Tenor of Ad Campaigns Affects Political Participation." Unpublished Manuscript.
- Brader, Ted, Nicholas A Valentino and Elizabeth Suhay. 2008. "What Triggers Public Opposition to Immigration? Anxiety, Group Cues, and Immigration Threat." *American Journal of Political Science* 52(4):959–978.

- Burke, P.A. and S. J. Dollinger. 2005. "'A picture's worth a thousand words': Language use in the autophotographic essay." *Personality and Social Psychology Bulletin* 31:536–548.
- Calboli, Federico C. F., Federica Tozzi, Nicholas W. Galwey, Athos Antoniadis, Vincent Mooser, Martin Preisig, Peter Vollenweider, Dawn Waterworth, Gerard Waeber, Michael R. Johnson, Pierandrea Muglia and David J. Balding. 2010. "A Genome-Wide Association Study of Neuroticism in a Population-Based Sample." *PLoS ONE* 5(7):e11504.
- Campbell, David. 2006. *Why We Vote: How Schools and Communities Shape our Civic Life*. Princeton: Princeton University Press.
- Carver, Charles S., Steven K. Sutton and Michael F. Scheier. 2000. "Action, Emotion, and Personality: Emerging Conceptual Integration." *Personality and Social Psychology Bulletin* 26(6):741–751.
- Carver, Charles S. and Teri L. White. 1994. "Behavioral Inhibition, Behavioral Activation, and Affective Responses to Impending Reward and Punishment: The BIS/BAS Scales." *Journal of Personality and Social Psychology* 67:319–319.
- Chen, Z.-Y., D. Jing, K. G. Bath, A. Ieraci, T. Khan, C.-J. Siao, D. G. Herrera, M. Toth, C. Yang, B. S. McEwen, B. L. Hempstead and F. S. Lee. 2006. "Genetic Variant BDNF (Val66Met) Polymorphism Alters Anxiety-Related Behavior." *Science* 314(5796):140–143.
- Cho, Wendy K. Tam, James Gimpel and Joshua Dyck. 2006. "Residential Concentration, Political Socialization, and Voter Turnout." *The Journal of Politics* 68:156–167.
- Civettini, Andrew J. W. and David P. Redlawsk. 2009. "Voters, Emotions, and Memory." *Political Psychology* 30(1):125–151.
- Clark, Lee Anna and David Watson. 1988. "Mood and the Mundane: Relations between Daily Life Events and Self-Reported Mood." *Journal of Personality and Social Psychology* 54(2):296.

- Cockburn, Myles, Ann Hamilton, J. Zadnick, Wendy Cozen and Thomas Mack. 2002. "The Occurrence of Chronic Diseases and Other Conditions in a Large Population-Based Cohort of Native California Twins." *Twin Research* 5(5):460–467.
- Conover, Pamela and Stanley Feldman. 1986. "Emotional Reactions to the Economy: I'm Mad as Hell and I'm Not Going to Take it Anymore." *American Journal of Political Science* 30(1):50–78.
- Cox, Gary and Michael Munger. 1989. "Closeness, Expenditures, and Turnout in the 1982 U.S. House Elections." *The American Political Science Review* 83(1):217–231.
- Damasio, Antonio. 1999. *The Feeling of What Happens*. New York: Harcourt, Brace and Co.
- Dawes, Christopher T. 2010. "Control and Turnout." Unpublished Manuscript.
- Dawes, Christopher T., David Cesarini, James H. Fowler, Magnus Johannesson, Patrik K.E. Magnusson and Sven Oskarsson. 2010. "Do Psychological Traits Mediate the Relationship Between Genes and Political Participation?" Unpublished Manuscript.
- Dawes, Christopher T. and James H. Fowler. 2009. "Partisanship, Voting, and the Dopamine D2 Receptor Gene." *The Journal of Politics* 71:1157–1171.
- Dawes, Christopher T. and Peter J. Loewen. 2011. "Heritability of Duty and Voter Turnout." *Political Psychology* forthcoming.
- Denny, Kevin and Orla Doyle. 2008. "Political Interest, Cognitive Ability and Personality: Determinants of Voter Turnout in Britain." *Brit. J. Polit. Sci.* 38(2):291–310.
- Dodd, Michael D., Amanda Balzer, Carly Jacobs, Michael Gruszczynski, Kevin B. Smith and John R. Hibbing. 2011. "The Left Rolls with the Good; The Right Confronts the Bad Physiology and Cognition in Politics." Working paper.

- Douzet, Frederick, Thad Kousser and Kenneth P. Miller, eds. 2008. *The New Political Geography of California*. Berkeley Public Policy Press.
- Druckman, J.N. and R. McDermott. 2008. "Emotion and the framing of risky choice." *Political Behavior* 30(3):297–321.
- Elliot, Andrew J. and Todd M. Thrash. 2002. "Approach-Avoidance Motivation in Personality: Approach and Avoidance Temperaments and Goals." *Journal of Personality and Social Psychology* 82(5):804–818.
- Erhardt, A., L. Czibere, D. Roeske, S. Lucae, P.G. Unschuld, S. Ripke, M. Specht, M.A. Kohli, S. Kloiber, M. Ising, A. Heck, H. Pfister, P. Zimmermann, R. Lieb, B. Pütz, M. Uhr, P. Weber, J.M. Deussing, M. Gonik, M. Bunck, M.S. Keßler, E. Frank, C. Hohoff, K. Domschke, P. Krakowitzky, W. Maier, B. Bandelow, C. Jacob, J. Deckert, S. Schreiber, J. Strohmaier, M. Nöthen, S. Cichon, M. Rietschel, T. Bettecken, M.E. Keck, R. Landgraf, B. Müller-Myhsok, F. Holsboer and E.B. Binder. 2011. "TMEM132D, a New Candidate for Anxiety Phenotypes: Evidence from Human and Mouse Studies." *Mol Psychiatry* 16:647–663.
- Fariss, Christopher J., Robert Bond, Jason Jones, Jaime E. Settle and James H. Fowler. 2011. "The Classification of Political Discussion." Paper presented at the annual meeting of the American Political Science Association.
- Feezell, J.T., M. Conroy and M. Guerrero. 2009. "Facebook is... Fostering Political Engagement: A Study of Social Network Groups and Offline Participation." Paper presented at the annual meeting of the American Political Science Association, Toronto, Canada.
- Fernandes, Juliana, Magda Giucanu, Kevin W. Bowers and Jeffrey C. Neely. 2010. "The Writing on the Wall: A Content Analysis of College Students' Facebook Groups for the 2008 Presidential Election." *Mass Communications and Society* 13(5):653–675.
- Festinger, L. 1957. *A Theory of Cognitive Dissonance*. Evanston, IL: Row, Peterson.

- Finifter, A.W. 1974. "The Friendship Group as a Protective Environment for Political Deviants." *The American Political Science Review* 68(2):607–625.
- Fiorina, Morris P. and Samuel J. Abrams. 2008. "Political Polarization in the American Public." *Annu. Rev. Polit. Sci.* 11:29.
- Fleisher, Richard and Jon R. Bond. 2000. In *Polarized Politics: Congress and the President in a Partisan Era*, ed. Jon R. Bond and Richard Fleisher. CQ Press.
- Fowler, James H., Laura A. Baker and Christopher T. Dawes. 2008. "Genetic Variation in Political Participation." *American Political Science Review* 102(02):16.
- Franz, M.M and T.N Ridout. 2010. "Political advertising and persuasion in the 2004 and 2008 presidential elections." *American Politics Research* 38(2):303.
- Freedman, Paul and Ken Goldstein. 1999. "Measuring Media Exposure and the Effects of Negative Campaign Ads." *American Journal of Political Science* 43(4):1189–1208.
- Freedman, Paul, Michael Franz and Kenneth Goldstein. 2004. "Campaign Advertising and Democratic Citizenship." *American Journal of Political Science* 48(4):723–741.
- Frijda, Nico. 1986. *The Emotions*. Cambridge: Cambridge University Press.
- Fromm, Erich. 1965. *Escape from Freedom*. New York: Avon.
- Fulker, D.S., S. Cherny, P. Sham and J. Hewitt. 1999. "Combined Linkage and Association Sib-Pair Analysis for Quantitative Traits." *American Journal of Human Genetics* 64:259–267.
- Funk, Carolyn, Kevin B. Smith, John Alford, Matthew V. Hibbing, Peter K. Hatemi and John R. Hibbing. 2010. "Toward a Modern View of Political Man: Genetic and Environmental Sources of Political Orientations and Participation." *American Political Science Association Conference Meeting* pp. 1–36.

- Gaudeman, James W. 2003. "Candidate Gene Association Analysis for a Quantitative Trait, Using Parent-Offspring Trios." *Genetic Epidemiology* 25(4):327–338.
- Gerber, Alan and Donald Green. 1999. "Does Canvassing Increase Voter Turnout? A Field Experiment." *Proceedings of the National Academy of Sciences of the United States of America* 96(19):10939–10942.
- Gerber, Alan and Donald Green. 2000a. "The Effect of a Nonpartisan Get-Out-the-Vote Drive: An Experimental Study of Leafletting." *The Journal of Politics* 62(3):846–857.
- Gerber, Alan and Donald Green. 2000b. "The Effects of Canvassing, Telephone Calls, and Direct Mail on Voter Turnout: A Field Experiment." *The American Political Science Review* 94(3):653–663.
- Gerber, Alan, Donald Green and Christopher Larimer. 2008. "Social Pressure and Voter Turnout: Evidence from a Large-Scale Field Experiment." *American Political Science Review* 102(1):17.
- Gerber, Alan, Donald Green and Christopher Larimer. 2010. "An Experiment Testing the Relative Effectiveness of Encouraging Voter Participation by Inducing Feelings of Pride or Shame." *Political Behavior* 32(3):409–422.
- Gerber, Alan, Gregory Huber, C. Raso and Shang E. Ha. 2009. "Personality and Political Behavior." Unpublished Manuscript.
- Gerber, Alan, Gregory Huber, David Doherty and Conor Dowling. 2009. "Re-assessing the Effects of Personality on Political Attitudes and Behaviors: Aggregate Relationships and Subgroup Differences." SSRN working paper <http://ssrn.com/abstract=1412839>.
- Gerber, Alan S., Gregory Huber, David Doherty, Conor M. Dowling and Shang Ha. 2010. "Personality and Political Attitudes: Relationships Across Issue Domains and Political Contexts." *Journal of Personality and Social Psychology* 104(1):111–133.

- Gibson, G. 2010. "Hints of hidden heritability in GWAS." *Nat Genet* 42(7):558–60.
- Giles, Michael and Marilyn Dantico. 1982. "Political Participation and Neighborhood Social Context Revisited." *American Journal of Political Science* 26(1):144–150.
- Gimpel, James G., J. Celeste Lay and Jason E. Schuknecht. 2003. *Why We Vote: How Schools and Communities Shape our Civic Life*. Washington D.C.: Brookings Institution.
- Gimpel, James G., Joshua J. Dyck and Daron R. Shaw. 2004. "Registrants, Voters, and Turnout Variability Across Neighborhoods." *Political Behavior* 26(4):343–375.
- Gimpel, J.G, K.M Kaufmann and S Pearson-Merkowitz. 2007. "Battleground states versus blackout states: The behavioral implications of modern presidential campaigns." *Journal of Politics* 69(3):786–797.
- Goldstein, Kenneth and Travis Ridout. 2002. "The Politics of Participation: Mobilization and Turnout over Time." *Political Behavior* 24(1):3–29.
- Goodman, Nicole, Heather Bastedo, Lawrence LeDuc and Jon H Pammett. 2011. "Young Canadians in the 2008 Federal Election Campaign: Using Facebook to Probe Perceptions of Citizenship and Participation." *Canadian Journal of Political Science* 44(4):859–881.
- Grabe, H.J., M. Lange, B. Wolff, H. Volzke, M. Lucht, H.J. Freyberger, U. John and I. Cascorbi. 2005. "Mental and Physical Distress is Modulated by a Polymorphism in the 5-HT Transporter Gene Interacting with Social Stressors and Chronic Disease Burden." *Molecular Psychiatry* 10(220-224).
- Graves, K.D., J.E. Schmidt, J. Bollmer, M. Fejfar, S. Langer, L.X. Blonder and M.A. Andrykowski. 2005. "Emotional Expression and Emotional Recognition in Breast Cancer Survivors: A Controlled Comparison." *Psychology and Health* 20:579–595.

- Green, Donald, Alan Gerber and David W Nickerson. 2003. "Getting out the Vote in Local Elections: Results from Six Door-to-Door Canvassing Experiments." *The Journal of Politics* 65(4):1083–1096.
- Grofman, B., Christian Collet and Robert Griffin. 1998. "Analyzing the Turnout-Competition Link with Aggregate Cross-Sectional Data." *Public Choice* 95(3/4):233–246.
- Gruszczynski, Michael W., Amanda Balzer, Carly M. Jacobs, Kevin B. Smith and John R. Hibbing. 2011. "The Physiology of Political Participation." Working paper.
- Hampton, K. and B. Wellman. 2001. "Long Distance Community in the Network Society - Contact and Support beyond Netville." *American Behavioral Scientist* 45(3):476–495.
- Hampton, Keith N., Lauren Sessions, Goulet Lee Rainie and Kristen Purcell. 2011. Social Networking Sites and our Lives: How People's Trust, Personal Relationships, and Civic and Political Involvement are Connected to their Use of Social Networking Sites and Other Technologies. Technical report Pew Research Center Internet and American Life Project.
URL: <http://pewinternet.org/Reports/2011/Technology-and-social-networks.aspx>
- Hariri, Ahmad. 2009. "The Neurobiology of Individual Differences in Complex Behavioral Traits." *Annual Review of Neuroscience* 32:225.
- Hatemi, Peter K. 2010. "An Exploration of Gene and Environment Interaction: The Influence of Major Life Events on Political Attitudes." Unpublished Manuscript.
- Hatemi, Peter K., John R. Alford, John R. Hibbing, Nicholas G. Martin and Lindon J. Eaves. 2009. "Is There a 'Party' in Your Genes?" *Political Research Quarterly* 62(3):584–600.
- Hatemi, Peter K., Rose McDermott, Lindon J. Eaves, Kenneth S. Kendler and

- Michael C. Neale. 2011. "Fear Dispositions and their Relationship to Political Preferences." Unpublished Manuscript.
- Hibbing, John R. and Elizabeth Theiss-Morse. 2002. *Stealth Democracy*. New York: Cambridge University Press.
- Hill, D and S.C. McKee. 2005. "The Electoral College, Mobilization, and Turnout in the 2000 Presidential Election." *American Politics Research* 33(5):700–725.
- Hillygus, D. 2005. "Campaign Effects and the Dynamics of Turnout Intention in Election 2000." *The Journal of Politics* 67(1):50–68.
- Ho, Daniel, Kosuke Imai, Gary King and Elizabeth Stuart. 2007. "Matching as Nonparametric Preprocessing for Reducing Model Dependence in Parametric Causal Inference." *Political Analysis* 15(3):199–236.
- Ho, Daniel, Kosuke Imai, Gary King and Elizabeth Stuart. 2011. "Matchit: Non-parametric Preprocessing for Parametric Causal Inference." *Journal of Statistical Software* 42(8).
- Hoffstetter, C. Richard. 1973. "Inter-Party Competition and Electoral Turnout: The Case of Indiana." *American Journal of Political Science* 17(2):351–366.
- Hopkins, Daniel J. and Gary King. 2010. "A Method of Automated Nonparametric Content Analysis for Social Science." *American Journal of Political Science* 54(1):229–247.
- Huckfeldt, R. Robert. 1986. *Politics in context: assimilation and conflict in urban neighborhoods*. New York, N.Y.: Agathon Press.
- Huckfeldt, R. Robert, Paul E. Johnson and John Sprague. 2004. *Political Disagreement: The Survival of Diverse Opinions within Communication Networks*. New York, N.Y.: Cambridge University Press.
- Huckfeldt, Robert. 1979. "Political Participation and the Neighborhood Context." *American Journal of Political Science* 23(3):579–591.

- Huckfeldt, Robert, Edward G. Carmines, Jeffery J. Mondak and Eric Zeemering. 2007. "Information, Activation, and Electoral Competition in the 2002 Congressional Elections." *The Journal of Politics* 69(3):798–812.
- Huckfeldt, Robert, Paul Johnson and John Sprague. 2002. "Political Environments, Political Dynamics, and the Survival of Disagreement." *The Journal of Politics* 64(1):1–21.
- Huddy, L., S. Feldman and C. Weber. 2007. "The Political Consequences of Perceived Threat and Felt Insecurity." *The ANNALS of the American Academy of Political and Social Science* 614(1):131–153.
- Huddy, Leonie and Lilliana Mason. 2008. "Heated Campaign Politics: An Intergroup Conflict Model of Partisan Emotions." Unpublished Manuscript.
- Huddy, Leonie, S. Feldman, C. Taber and G. Lahav. 2005. "Threat, Anxiety, and Support of Antiterrorism Policies." *American Journal of Political Science* 49(3):593–608.
- Huddy, Leonie, S. Feldman and Erin Cassese. 2006. On the Distinct Political Effects of Anxiety and Anger. In *The Political Dynamics of Feeling and Thinking*, ed. George E. Marcus Ann Crigler, Michael MacKuen and W. Russell Neuman. University of Chicago Press.
- Jackman, R. 1987. "Political institutions and voter turnout in industrial democracies." *American Political Science Review* 81:405–24.
- Jackman, Simon and Lynn Vavreck. 2009. "The Magic of the Battleground: Uncertainty, Learning and Changing Information Environments in the 2008 Presidential Campaign." Paper prepared for presentation at UCSD seminar, May 16, 2009.
- Jacobs, N., G. Kenis, F. Peeters, C. Derom, R. Vlietinck and J. van Os. 2006. "Stress-Related Negative Affectivity and Genetically Altered Serotonin Transporter Function: Evidence of Synergism in Shaping Risk of Depression." *Archives of General Psychiatry* 63(9):989–996.

- Jacobson, Gary. 2007. "The War, the President, and the 2006 Midterm Congressional Elections." Prepared for delivery at the Annual Meeting of the Midwest Political Science Association.
- Jacobson, K. and D. Rowe. 1998. "Genetic and Shared Environmental Influences on Adolescent BMI: Interactions with Race and Sex." *Behavior Genetics* 28(4):265–278.
- Jones, Jason J., Robert M. Bond, Christopher J. Fariss, Jaime E. Settle, Adam Kramer, Cameron Marlow and James H. Fowler. 2011. "Yahtzee: An Anonymized Group Level Matching Procedure." *CoRR* abs/1112.1038.
- Jost, John T, J. L Napier, H Thorisdottir, S. D Gosling, T. P Palfai and B Ostafin. 2007. "Are Needs to Manage Uncertainty and Threat Associated With Political Conservatism or Ideological Extremity?" *Personality and Social Psychology Bulletin* 33(7):989–1007.
- Jost, John T., Jack Glaser, Arie W. Kruglanski and Frank J. Sulloway. 2003. "Political Conservatism as Motivated Social Cognition." *Psychological Bulletin* 129(3):339–375.
- Karpowitz, C. F., J. Q. Monson, L. Nielson, K. D. Patterson and S. A. Snell. 2011. "Political Norms and the Private Act of Voting." *Public Opinion Quarterly* 75(4):659–685.
- Karpowitz, C. F., J. Q. Monson, L. Nielson, K. D. Patterson and S. A. Snell. 2012. "The People in Your Neighborhood: How Political Minority Status Affects Political Participation." Presented at the annual meeting of the Midwest Political Science Association, Chicago, IL.
- Kaufman, J., B.Z. Yang, H. Douglas-Palumberi, D. Grasso, D. Lipschitz, S. Houshyar, J.H. Krystal and J. Gelernter. 2006. "Brain-Derived Neurotrophic Factor-5-HTTLPR Gene Interactions and Environmental Modifiers of Depression in Children." *Biol Psychiatry* 59(8):673–680.

- Kaufman, J., B.Z. Yang, H. Douglas-Palumberi, S. Houshyar, D. Lipschitz, J.H. Krystal and J. Gelernter. 2004. "Social Supports and Serotonin Transporter Gene Moderate Depression in Maltreated Children." *Proceedings of the National Academy of Sciences of the United States of America Natl Acad Sci USA* 101(49):17316–17321.
- Kendler, Kenneth S., Jonathan W. Kuhn, Jen Vittum, Carol A. Prescott and Brien Riley. 2005. "The Interaction of Stressful Life Events and a Serotonin Transporter Polymorphism in the Prediction of Episodes of Major Depression: A Replication." *Arch Gen Psychiatry* 62(5):529–535.
URL: <http://archpsyc.ama-assn.org/cgi/content/abstract/62/5/529>
- Kenny, Chris B. 1992. "Political Participation and Effects from the Social Environment." *American Journal of Political Science* 36(1):259–267.
- Kinder, Donald. 1994. Reason and Emotion in American Political Life. In *Beliefs, Reasoning, and Decision Making*, ed. Roger C. Schank and Ellen Langer. Lawrence Erlbaum pp. 277–314.
- King, Gary and Will Lowe. 2003. "An Automated Information Extraction Tool for International Conflict Data with Performance as Good as Human Coders: A Rare Events Evaluation Design." *International Organization* 57(3):617–642.
- Klemmensen, Robert, Sara Binzer Hobalt, Asbjorn Sonne Norgaard, Inge Petersen and Axel Skyttthe. 2010. "Genetic Variation in Political Participation and Civic Duty." Paper presented at the annual meeting of the Midwest Political Science Association.
- Kushin, M.J. and K. Kitchener. 2009. "Getting Political on Social Network Sites: Exploring Online Political Discourse on Facebook." Paper presented at the annual convention of the Western States Communication Association, Phoenix, AZ.
- Lazer, D., A.S Pentland, L. Adamic, S. Aral, A.L. Barabasi, D. Brewer, N. Christakis, N. Contractor, J. Fowler, M. Gutmann, T. Jebara, G. King, M. Macy, D.

- Roy and M. Van Alstyne. 2009. "Life in the Network: The Coming Age of Computational Social Science." *Science* 323(5915):721–723.
- Lerner, J. S. and D. Keltner. 2001. "Fear, Anger and Risk." *Journal of Personality and Social Psychology* 81(1):146–159.
- Lerner, J. S., R. M. Gonzalez, D. A. Small and B. Fischhoff. 2003. "Effects of Fear and Anger on Perceived Risks of Terrorism: A National Field Experiment." *Psychological Science* 14:144–150.
- Lewis, Kevin, Jason Kaufman, Marco Gonzalez, Andreas Wimmer and Nicholas Christakis. 2008. "Tastes, Ties, and Time: A New Social Network Dataset using Facebook.com." *Social Networks* 30(4):330–342.
- Lipsitz, K. 2009. "The Consequences of Battleground and "Spectator" State Residency for Political Participation." *Political Behavior* 31(2):187–209.
- Lodge, M. and C.S. Taber. 2005. "The Automaticity of Affect for Political Candidates, Parties, and Issues: An Experimental Test of the Hot Cognition Hypothesis." *Political Psychology* 26(3):455–482.
- Lyman, Peter and Hal R. Varian. 2003. How Much Information 2003? Technical report University of California, Berkeley.
- MacKuen, Michael. 1990. Speaking of Politics: Individual Conversational Choice, Public Opinion, and the Prospects for Deliberative Democracy. In *Information and democratic process*, ed. J. Ferejohn and J. Kuklinski. Urbana: University of Illinois Press.
- MacKuen, Michael B., George E. Marcus, W. Russell Neuman and Patrick R. Miller. N.d. "Affective Intelligence or Personality? State vs. Trait Influences on Citizens' Use of Political Information." Paper prepared for delivery at the annual meeting of the American Political Science Association, September 2-5, 2010.

- Manolio, Teri A., Francis S. Collins, Nancy J. Cox, David B. Goldstein, Lucia A. Hindorff, David J. Hunter, Mark I. McCarthy, Erin M. Ramos, Lon R. Cardon, Aravinda Chakravarti, Judy H. Cho, Alan E. Guttacher, Augustine Kong, Leonid Kruglyak, Elaine Mardis, Charles N. Rotimi, Montgomery Slatkin, David Valle, Alice S. Whittemore, Michael Boehnke, Andrew G. Clark, Evan E. Eichler, Greg Gibson, Jonathan L. Haines, Trudy F. C. Mackay, Steven A. McCarroll and Peter M. Visscher. 2009. "Finding the Missing Heritability of Complex Diseases." *Nature* 461(7265):747–753.
- Mansbridge, Jane J. 1980. *Beyond Adversary Democracy*. New York, NY: Basic Books.
- Marcus, George, W. Russell Neuman and Michael Mackuen. 2000. *Affective Intelligence and Political Judgement*. University of Chicago Press.
- Masket, Seth E. 2009. "Did Obama's Ground Game Matter?" *Public Opinion Quarterly* 73(5):1023.
- McCarty, Nolan M., Keith T. Poole and Howard Rosenthal. 2006. *Polarized America: The Dance of Ideology and Unequal Riches*. MIT Press.
- McClurg, Scott D. 2006. "Political disagreement in context: The conditional effect of neighborhood context, disagreement and political talk on electoral participation." *Political Behavior* 28(4):349–366.
- McCrae, Robert and Paul Costa. 1992. "An Introduction to the Five-Factor Model and its Implications." *Journal of Personality* 60:175–215.
- McCrae, Robert R., Matthew Scally, Antonio Terracciano and Goncalo R. Abecasis. 2010. "An Alternative to the Search for Singly Polymorphisms: Toward Molecular Personality Scales for the Five-Factor Model." *Journal of Personality and Social Psychology* 99(6):1014–1024.
- McLean, Scott, John Garza, Sandra Wiebe, Michael Dodd, Kevin Smith and Kimberly Andrews Espy. 2011. "The Differential Attention Biases of Liberals and Conservatives." Working paper.

- McLeod, J.M., D.A. Scheufele, P. Moy, E.M. Horowitz, R.L. Holbert, W. Zhang, S. Zubric and J Zubric. 1999. "Understanding Deliberation: The Effects of Discussion Networks on Participation in a Public Forum." *Communication Research* 26(6):743–774.
- Miller, Joanne and Jon Krosnick. 2004. "Threat as a Motivator of Political Activism: A Field Experiment." *Political Psychology* 25(4):507–523.
- Miller, Warren. 1956. "One-Party Politics and the Voter." *The American Political Science Review* 50(3):707–725.
- Mondak, Jeffery J. and Karen D. Halperin. 2008. "A Framework for the Study of Personality and Political Behaviour." *British Journal of Political Science* 38(02):28.
- Mondak, Jeffrey. 2010. *Personality and the Foundations of Political Behavior*. Cambridge University Press.
- Mondak, Jeffrey, Matthew V. Hibbing, Damarys Canache, Mitchell A. Seligson and Mary R. Anderson. 2010. "Personality and Civic Engagement: An Integrative Framework for the Study of Trait Effects on Political Behavior." *American Political Science Review* 104:85–110.
- Muller, C. 1999. "Networks of 'Personal Communities' and 'Group Communities' in Different Online Communication Services." Paper presented at the Proceedings of the Exploring Cyber Society: Social, Political, Economic and Cultural Issues, University of Northumbria at Newcastle, United Kingdom.
- Murphy, D.L. and K.L. Lesch. 2008. "Targeting the Murine Serotonin Transporter: Insights into Human Neurobiology." *Nature Reviews Neuroscience* 9:85–96.
- Mutz, D.C and B Reeves. 2005. "The new videomalaise: Effects of televised incivility on political trust." *American Political Science Review* 99(01):1–15.
- Mutz, Diana. 2002. "The Consequences of Cross-Cutting Networks for Political Participation." *American Journal of Political Science* 46(4):838–855.

- Nardulli, Peter F. and James H. Kuklinski. 2007. Testing Some Implications of Affective Intelligence Theory at the Aggregate Level. In *The Affect Effect: Dynamics of Emotion in Political Thinking and Behavior*, ed. W. Russell Neuman, George E. Marcus, Michael MacKuen and Ann Crigler. University of Chicago Press.
- Newport, Frank. 2007. Poll: 7 in 10 Americans Say Obama Will Win. Technical report Gallup Politics.
- Nickerson, David W., R. D. Friedrichs and D.C. King. 2006. "Partisan Mobilization Campaigns in the Field: Results From a Statewide Turnout Experiment in Michigan." *Political Research Quarterly* 59(1):85–97.
- Noelle-Neuman, Elisabeth. 1993. *The Spiral of Silence*. Chicago, IL: University of Chicago Press.
- Norris, Catherine J., Jeff T. Larsen and John T. Caciopo. 2007. "Neuroticism is Associated with Larger and More Prolonged Electrodermal Responses to Emotionally Evocative Pictures." *Psychophysiology* 44(5):823–826.
- Owen, J.E., J.C. Klapow, D. L. Roth and D.C. Tucker. 2004. "Use of the Internet for Information and Support: Disclosure among Persons with Breast and Prostate Cancer." *Journal of Behavioral Medicine* 27:491–505.
- Oxley, D. R, K. B Smith, J. R Alford, M. V Hibbing, J. L Miller, M Scalora, P. K Hatemi and J. R Hibbing. 2008. "Political Attitudes Vary with Physiological Traits." *Science* 321(5896):1667–1670.
- Panagopoulos, C. 2009. "Campaign dynamics in battleground and nonbattleground states." *Public Opinion Quarterly* 73(1):119.
- Panagopoulos, Costas. 2010. "Affect, Social Pressure and Prosocial Motivation: Field Experimental Evidence of the Mobilizing Effects of Pride, Shame and Publicizing Voting Behavior." *Political Behavior* 32(3):369–386.
- Parsons, Bryan M. 2009. "Social Networks and the Affective Impact of Political Disagreement." *Political Behavior* 32(2):181–204.

- Patterson, S. and G. Caldeira. 1983. "Getting Out the Vote: Participation in Gubernatorial Elections." *American Political Science Review* 77(3):675–689.
- Patterson, S. and G. Caldeira. 1984. "The Etiology of Partisan Competition." *American Political Science Review* (78):691–707.
- Pattie, C. J. and R. J. Johnston. 2000. "'People Who Talk Together Vote Together': An Exploration of Contextual Effects in Great Britain." *Annals of the Association of American Geographers* 90(1):41–66.
- Pattie, C. J. and R. J. Johnston. 2009. "Conversation, Disagreement and Political Participation." *Political Behavior* 31(2):261–285.
- Pennebaker, James W, Martha E Francis and Roger J Booth. 2001. *Linguistic Inquiry Word Count*. Mahwah, New Jersey: Erlbaum Publishers.
- Pennebaker, J.W. and C.T. Lay. 2002. "Language Use and Personality During Crises: Analysis of Mayor Rudolph Giuliani's Press Conferences." *Journal of Research in Personality* 36:271–282.
- Poole, Keith and Howard Rosenthal. 1984. "The Polarization of American Politics." *The Journal of Politics* 46(4):1061–1079.
- Poole, Keith and Howard Rosenthal. 1997. *Congress: A Political-Economic History of Roll Call Voting*. Oxford University Press.
- Pritchard, J.K., M. Stephens and P. Donnelly. 2000. "Inference of Population Structure Using Multilocus Genotype Data." *Genetics* 155(2):945–959.
- Purcell, S., B. Neale, K. Todd-Brown, L. Thomas, A. Ferreira, D. Bender, J. Maller, P. Sklar, P. de Bakker, Mark. Daly and P. Sham. 2007. "PLINK: A Tool Set for Whole-Genome Association and Population-Based Linkage Analysis." *American Journal of Human Genetics* 81:559–575.
- Putnam, Robert. 1966. "Political Attitudes and the Local Community." *The American Political Science Review* 60(3):640–654.

- Redlawsk, David P. 2007. Motivated Reasoning, Affect, and the Role of Memory in Voter Decision Making. In *The Affect Effect: Dynamics of Emotion in Political Thinking and Behavior*, ed. W. Russell Neuman, George E. Marcus, Michael MacKuen and Ann Crigler. University of Chicago Press pp. 87–108.
- Rheingold, H. 2000. *The Virtual Community*. Cambridge, MA: MIT Press.
- Rhodes, R.A., N.V. Murthy, M.A. Dresner, S. Selvaraj, N. Stavrakakis, S. Babar, P.J. Cohen and P.M. Gasby. 2007. "Human 5-HT Transporter Availability Predicts Amygdala Reactivity in Vivo." *Journal of Neuroscience* 27:9233–9237.
- Ridout, Travis N and Kathleen Searles. 2011. "It's My Campaign I'll Cry if I Want to: How and When Campaigns Use Emotional Appeals." *Political Psychology* 32(3):439–458.
- Riker, William H. and Peter C. Ordeshook. 1968. "A Theory of the Calculus of Voting." *American Political Science Review* 62:25–42.
- Rosenstone, S. and J. Hansen. 1993. *Mobilization, Participation, and Democracy in America*. New York: Macmillan.
- Rusting, C.L. and R.J. Larsen. 1995. "Moods as Sources of Stimulation: Relationships between Personality and Desired Mood States." *Personality and Individual Differences* 18(3):321–329.
- Ryan, Timothy J. 2011. "Anger and Political Information: Evidence from Digital-Age Field Experiments." Working manuscript.
- Scarr, Sandra and Kathleen McCartney. 1983. "How People Make Their Own Environments: A Theory of Genotype to Environment Effects." *Child Development* 54(2):424–435.
- Schaffner, Brian F. 2011. Polling: Innovations in Survey Research. In *New Directions in Campaigns and Elections*, ed. Stephen K. Medvic. Routledge chapter 3, pp. 39–58.

- Schkade, David, Cass R Sunstein and Reid Hastie. 2006. "What Happened on Deliberation Day?" *John M. Olin Law & Economics Research Series Working Paper No. 298; AEI-Brookings Joint Center for Regulatory Studies Working Paper No. 06-19* .
URL: <http://www.jstor.org/stable/10.2307/20439113>
- Sen, S., M. Burmeister and D. Ghosh. 2004. "Meta-Analysis of the Association between a Serotonin Transporter Promoter Polymorphism (5-HTTLPR) and Anxiety-Related Personality Traits." *American Journal of Medical Genetics* 127B(1):85–89.
- Settle, Jaime E., Christopher T. Dawes and James H. Fowler. 2009. "The Heritability of Partisan Attachment." *Political Research Quarterly* 62(3):601–613.
- Settle, Jaime E., Christopher T. Dawes, Nicholas A. Christakis and James H. Fowler. 2010. "Friendships Moderate an Association between a Dopamine Gene Variant and Political Ideology." *The Journal of Politics* 72(04):1189–1198.
- Shanahan, Michael J. and Scott M. Hofer. 2005. "Social Context in Gene-Environment Interactions: Retrospect and Prospect." *J Gerontol B Psychol Sci Soc Sci* 60 Spec No 1:65–76.
- Shaw, Daron. 1999. "The Effect of TV Ads and Candidate Appearances on Statewide Presidential Votes, 1988-96." *The American Political Science Review* 93(2):345–361.
- Shaw, Daron. 2006. *The Race to 270: The Electoral College and the Campaign Strategies of 2000 and 2004*. Chicago: University of Chicago Press.
- Shifman, S., A. Bhomra, S. Smiley, N.R. Wray, M.R. James, N.G. Martin, J.M. Hettema, S.S. An, M.C. Neale, E.J.C.G. Van Den Oord, K.S. Kendler, X. Chen, D.I. Boomsma, C.M. Middeldorp, J.J. Hottenga, P.E. Slagboom and J. Flint. 2008. "A Whole Genome Association Study of Neuroticism using DNA Pooling." *Mol Psychiatry* 13(3):302–312.

- Silberman, J. and G. Durden. 1975. "The Rational Behavior Theory of Voter Participation: The Evidence from Congressional Elections." *Public Choice* 23(1):101–108.
- Stein, M., N. Schork and J. Gelernter. 2004. "A Polymorphism of the Beta One Adrenergic Receptor is Associated with Low Extraversion." *Biological Psychiatry* 56:217–224.
- Stein, Murray B., Margaret Daniele Fallin, Nicholas J. Schork and Joel Gelernter. 2005. "COMT Polymorphisms and Anxiety-Related Personality Traits." *Neuropsychopharmacology* 30(11):2092–2102.
- Stein, Murray B., Nicholas J. Schork and Joel Gelernter. 2007. "Gene-by-Environment (Serotonin Transporter and Childhood Maltreatment) Interaction for Anxiety Sensitivity, an Intermediate Phenotype for Anxiety Disorders." *Neuropsychopharmacology* 33(2):312–319.
URL: <http://dx.doi.org/10.1038/sj.npp.1301422>
- Stein, Murray B, S Seedat and J Gelernter. 2006. "Serotonin Transporter Gene Promoter Polymorphism Predicts SSRI Response in Generalized Social Anxiety Disorder." *Psychopharmacology (Berl)* 187.
- Stonecash, Jeffrey M., Mark D. Brewer and Mark D. Mariani. 2003. *Diverging Parties: Social Change, Realignment, and Party Polarization*. Boulder, CO: Westview Press.
- Strauch, Ralph E. 1975. "'Squishy' Problems and Quantitative Methods." *Policy Sciences* 6(2):175–184.
- Sunstein, Cass. 2001. *Republic.com*. Princeton, NJ: Princeton University Press.
- Terracciano, Antonio, Lenuta Balaci, Jason Thayer, Matthew Scally, Sarah Kokinos, Luigi Ferrucci, Toshiko Tanaka, Alan B Zonderman, Serena Sanna, Nazario Olla, Maria Antonietta Zuncheddu, Silvia Naitza, Fabio Busonero, Manuela Uda, David Schlessinger, G.R. Abecasis and Paul T Costa. 2009. "Variants of the Serotonin Transporter Gene and NEO-PI-R Neuroticism:

- No Association in the BLSA and SardiNIA Samples." *Am. J. Med. Genet.* 150B(8):1070–1077.
- Ulbig, SG and Carolyn Funk. 1999. "Conflict avoidance and political participation." *Polit Behav* 21(3):265–282.
- Valentino, N., K. Gregorowicz and E. Groenendyk. 2009. "Efficacy, Emotions and the Habit of Participation." *Political Behavior* 31:307–330.
- Valentino, N., V. Hutchings, A. Banks and A. Davis. 2008a. "Is a Worried Citizen a Good Citizen? Emotions, Political Information Seeking, and Learning via the Internet." *Political Psychology* 29(2):247–273.
- Valentino, N.A, T Brader, E.W Groenendyk, K Gregorowicz and V.L Hutchings. 2011. "Election Night's Alright for Fighting: The Role of Emotions in Political Participation." *The Journal of Politics* 73(1):156–170.
- Valentino, Nicholas, Vincent Hutchings, Antoine Banks and Anne Davis. 2008b. "Is a Worried Citizen a Good Citizen? Emotions, Political Information Seeking, and Learning via the Internet." *Political Psychology* 29(2):247–273.
- van den Oord, E.J.C.G, P.H Kuo, A.M Hartmann, B.T Webb, H.J Moller, J.M Hettema, I Giegling, J Bukszar and D Rujescu. 2008. "Genomewide association analysis followed by a replication study implicates a novel candidate gene for neuroticism." *Archives of general psychiatry* 65(9):1062.
- van IJzendoorn, Marinus H., Marian J. Bakermans-Kranenburg, Jay Belsky, Steven Beach, Gene Brody, Kenneth A. Dodge, Mark Greenberg, Michael Posner and Stephen Scott. 2011. "Gene-by-Environment Experiments: A New Approach to Finding the Missing Heritability." *Nature Reviews Genetics* .
- Vecchione, Michele and Gian Vittorio Caprara. 2009. "Personality Determinants of Political Participation: The Contribution of Traits and Self-Efficacy Beliefs." *Personality and Individual Differences* 46:487–492.
- Verba, S., K. Schlozman and H. Brady. 1995. *Voice and Equality: Civic Volunteerism in American Politics*. Cambridge: Harvard University Press.

- Verweij, Karin J.H., Brendan P. Zietsch, Sarah E. Medland, Scott D. Gordon, Beben Benyamin, Dale R. Nyholt, Brian P. Mcevoy, Patrick F. Sullivan, Andrew C. Heath, Pamela A.F. Madden, Anjali K. Henders, Grant W. Montgomery, Nicholas G. Martin and Naomi R. Wray. 2010. "A Genome-Wide Association Study of Cloninger's Temperament Scales: Implications for the Evolutionary Genetics of Personality." *Biological Psychology* 85(2):306–317.
- Visscher, P.M. 2008. "Sizing up Human Height Variation." *Nature Genetics* 40(5):489–490.
- Vitak, Jessica, Paul Zube, Andrew Smock, Caleb T Carr, Nicole Ellison and Cliff Lampe. 2011. "It's Complicated: Facebook Users' Political Participation in the 2008 Election." *Cyberpsychology, Behavior, and Social Networking* 14(3):107–114.
- Wang, D., Y. Sun, P. Stang, J. Berlin, M. Wilcox and Q. Li. 2009. "Comparison of Methods for Correcting Population Stratification in a Genome-Wide Association Study of Rheumatoid Arthritis: Principal-Components Analysis Versus Multidimensional Scaling." *BMC Proceedings* 3(Suppl 7)(S109):1–6.
- Watson, D. and L.A. Clark. 1984. "Negative Affectivity: The Disposition to Experience Aversive Emotional States." *Psychological Bulletin* 96(3):465.
- Watson, David, Lee Anna Clark and Greg Carey. 1988. "Positive and Negative Affectivity and Their Relation to Anxiety and Depressive Disorders." *Journal of Abnormal Psychology* 97(3):346–353.
- Wellman, B., A.Q. Haase J. Witte and K. Hampton. 2001. "Does the Internet Increase, Decrease, or Supplement Social Capital? Social Networks, Participation, and Community Commitment." *American Behavioral Scientist* 45(3):437–456.
- Wolak, Jennifer and George E. Marcus. 2007. "Personality and Emotional Response: Strategic and Tactical Responses to Changing Political Circum-

- stances." *The ANNALS of the American Academy of Political and Social Science* 614(1):172.
- Yang, B., H. Zhao, H. Kranzler and J. Gelernter. 2005. "Practical Population Group Assignment with Selected Informative Markers: Characteristics and Properties of Bayesian Clustering via Structure." *Genetic Epidemiology* 28(4):302–312.
- Yang, J. and J. Leskovec. 2011. "Temporal Variation in Online Media." Paper presented at ACM International Conference on Web Search and Data Mining.
- Zhang, L, Jennifer Wessel, Brian P. Kennedy, Brinda K. Rana, Laurent Taupenot, Elizabeth O. Lillie, Myles Cockburn, Nicholas J. Schork, Michael G. Ziegler and Daniel T. O'Connor. 2004. "Functional allelic heterogeneity and pleiotropy of a repeat polymorphism in tyrosine hydroxylase: prediction of catecholamines and response to stress in twins." *Physiological Genomics* 19(3):277–291.