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Partisanship, Political Information, and Money

A Dissertation presented

by

Jeeyoung Park

to

The Graduate School

in Partial Fulfillment of the

Requirements

for the Degree of

Doctor of Philosophy

in

Political Science

Stony Brook University

August 2016

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Abstract of the Dissertation

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Stony Brook University

2016

Abstract

This dissertation contains three parts - three papers. My dissertation tries to bridge the gap between two perspectives: the socio-psychological model and the rational choice model in voting behavior. The first part investigates how partisans behave in the prediction market. Using an agent-based model, my simulation results show that participants' initial beliefs about a candidate's winning probability, confirmation biases in accepting information, and monetary incentives strongly increase changes in participants' beliefs about the electoral outcome captured by price volatility in the prediction market. The second part explores the microfoundation about individuals' behavioral motivations in evaluating political candidates. My experimental results suggest that party identification may be either enhanced or weakened through the lens of utility maximization as well as a partisan perceptual screen. The third part examines how expected government partisanship matters for specific industrial sector or firm profitability during an election period. The empirical findings from EGARCH models confirm that the probability of an ideologically different party winning influences the returns of the defense and health care sectors. For the firm level analysis, my result also shows that the public announcement of Palin as McCain's running mate decreases both actual and abnormal returns of firms associated with Obama's key policies.

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Acknowledgments

I would like to express my thanks to the many people who have helped me complete my dissertation. First, I would like to thank my committee members. Oleg Smirnov, Helmut Norpoth, Matthew Lebo, and Christopher Dawes have provided invaluable insights and advice that have been instrumental in helping me navigate the dissertation process and improve my work. I am grateful for my advisor Oleg Smirnov's extra efforts that made it possible for me to write this dissertation. I am especially grateful for the experience, optimism, and support given to me by Helmut Norpoth. They are the best teachers and mentors that will be my role models for my future career. I am also grateful for the grant from the Center for Political Behavioral Economy at Stony Brook University, which funded my experiment. Finally, I would like to thank my family. This journey would not have been possible without the active support, encouragement, and love of my family. When I started to write this dissertation, my daughter, Hannah, was just born; she turns three years old. I would like to thank Hannah for her understanding and support these last few years. To my husband, Kiyong Chang, I express my deepest thanks. His support, confidence, and love have given me a motivation and purpose. I could not ask for a better partner and mentor. I particularly thank my parents, Soobok Song and Chung-In Park, and my elder sister, Meeyoung, for their love and the continuous support they have given me throughout my life. I would also like to thank my parents-in-law for their encouragement throughout this entire process.

1 Introduction

“Party has a profound influence across the full range of political objects to which the individual voter responds. The strength of relationship between party identification and the dimensions of partisan attitude suggests that responses to each element of national politics are deeply affected by the individuals enduring partisan attachments.”

Campbell et al.(1960, 128)

In August 2010, the Pew Research Center¹ conducted a poll which found that almost 20 percent of Americans mistakenly believe that President Obama is a Muslim. In particular, the view that Obama is a Muslim is more widespread among Republicans: while only 10% of Democrats say Obama is a Muslim, 31% of Republicans say Obama is a Muslim. Similarly, CNN’s poll² showed that 41% of Republicans think Obama was “probably” or “definitely” not born here. Newsweek³ also found that 52% of Republicans thought that the claim that Obama wanted to impose Islamic law was “definitely” or “probably” true. These figures are consistent with other polls showing differences by party on politically salient issues. This example shows that what people believe to be true about political matters is mainly influenced by their partisanship.

Many studies have attempted to explain how partisan differences affect individuals’ political behaviors. Since *The American Voter* (Campbell et al. 1960), numerous studies have examined the impact of partisanship on vote choice, economic assessments, political knowledge, and opinions about important political issues (Norpoth 1984, 1996; Lewis-Beck et al. 2008; Bartels 2000, 2002, 2006; Conover, Feldman, and Knight 1986, 1987; Prior 2007; D’Elia and Norpoth 2014; Gaines et al. 2007; Jacobson 2006; Jerit and Barabas 2012).

¹<http://www.people-press.org/2010/08/19/growing-number-of-americans-say-obama-is-a-muslim/>

²<http://politicalticker.blogs.cnn.com/2010/08/04/cnn-poll-quarter-doubt-president-was-born-in-u-s/?fbid=Y8Ysrq0EY3i>

³<http://nw-assets.s3.amazonaws.com/pdf/1004-ftop.pdf>

The nature of partisanship is the subject of one of the longest running debates in the study of American political behavior. One of the most prominent theories of voting behavior, the Michigan model (Campbell et al. 1960) argues that vote choice is overwhelmingly defined by partisanship. Campbell et al. (1960) view partisanship as “the individual’s affective orientation to an important group-object in his environment” (Campbell, et al. 1960, 121). Partisanship is stable from election to election and most voters do not change their party affiliation during their life. It serves as the most influential factor in the voting calculus. Thus, vote choice is based on a deeply rooted psychological and emotional attachment to a given party. Over time, many researchers have located partisanship at the core of people’s political belief systems. Moreover, the vast literature on party cues suggests parties can drive opinion formation and change across a variety of domains, including issues (Bartels 2002; Coan et al. 2008; Conover and Feldman 1989; Feldman and Conover 1983; Jacoby 1988; Kam 2005; Mondak 1993a, 1993b).

In contrast, the revisionist model argues that partisanship is a dynamic cognitive phenomenon that is readily influenced by short-term political forces (Fiorina 1981; Downs 1957; Key 1966). In the revisionist view, partisanship is a measure of individuals’ current evaluations of the parties, as well as an evaluation that is responsive to the flow of political events and reflects changing views of the two major parties. Thus, partisanship constitutes a running tally of partisan evaluations based on contemporary political information. The theoretical basis for this claim is that issue orientations are more central than partisanship. That is, rather than adjusting their issue positions to conform with their partisanship, this line of research suggests that individuals alter their partisanship to bring it in line with their issue preferences.

In the context of American politics, Democrats and Republicans see “separate realities” (Kull et al. 2004), with differences arising due to partisanship as a “perceptual screen” in information acquisition and processing (Campbell et al. 1960). Political scientists have used this theoretical perspective to explain partisan biases in attitude change and decision-

making (Brady and Sniderman 1985; Lodge and Taber 2000; Nir 2011; Redlawsk 2002; Taber and Lodge 2006). A developing body of research shows that voters may operate as motivated reasoners, attempting to hold to their existing positive evaluation by using any one of a number of processes in order to explain away new incongruent information (Kunda 1990; Lodge and Taber 2000; Taber and Lodge 2006; Redlawsk 2002). Theories of motivated reasoning suggest that political information consistent with an individual's ideology or partisanship is more likely to be believed, regardless of its veracity (Garrett and Weeks 2013; Nyhan and Reifler 2010). Certainly, partisanship matters, for political beliefs and misperceptions often fall along party lines. Democrats and Republicans vary in their accuracy regarding the facts about politics (Gaines et al. 2007).

However, people do not always interpret political information in a way that is biased toward their partisan leanings, but instead at times consider information in a more even-handed manner (Bullock 2009; Druckman 2012; MacKuen et al. 2010). Zechman (1979) and Achen (1992) propose statistical models of partisanship based on a Bayesian model. Bayesian learning models theorize that people rationally update their beliefs or attitudes by assimilating new information with their prior beliefs and attitudes. Gerber and Green (1999) argue that “perceptual bias” can be explained in Bayesian terms: partisans accord negative evidence for their candidates less weight not because they irrationally disregard discordant information, but because it conflicts with their priors.

Building on the previous studies, my dissertation aims to provide both the relevant theoretical and empirical framework to understand the dynamics of political actors' partisanship beyond stable and persistent partisan identification. In my dissertation, I want to answer three key questions about how either individuals' or the government's (or electoral candidates') partisanship lead to behavioral differences using methods and concepts from American politics, behavioral economics, and related disciplines.

The three papers in my dissertation deal with partisanship under private interests (or monetary incentives). The first theoretical question to address is how individual par-

tisanship shapes political perception and judgment under private interests (or monetary incentives). An individual's perception of political facts may be heavily influenced by her perception bias. In my dissertation, I argue that individuals' private interests may reduce partisan biases. This suggests that Republicans (or Democrats) under private interests may be less likely to overestimate the rates of unemployment or criticize the government's policy during a Democratic (or a Republican) presidency. Monetary incentives include any potential policy benefits partisans are expected to receive in the real world. For example, Republican beneficiaries of Obamacare may consider political information about health care reform in a less biased manner. At the same time, my dissertation also implies that excessive private interests may not help reduce individuals' partisan biases. In my simulation, excessive monetary incentives lead to more volatility in market prices because market participants are highly sensitive to political information. Taken together, the optimal level of monetary incentives can be a good method of improving the performance of individuals in judging political information. Such financial rewards give partisans motivation to assess political information in a less biased manner.

In a related manner, the second question is how political knowledge affects individuals' partisan biases under private interests. The Bayesian updating model simply suggests that political information may lead both Republican and Democrats' beliefs to converge. However, my dissertation suggests that partisan bias could be greater among politically knowledgeable partisans despite conventional wisdom. Politically sophisticated partisans may hold the strongest attitudes with the most confidence. Knowledgeable partisans may be better equipped to discredit information that challenge their established beliefs or attitudes (Lodge and Taber 2000). Partisans with a higher level of political knowledge may seek out more likeminded information. Thus, given financial rewards, the tipping point may occur rapidly when partisans are less knowledgeable.

The third question is how electoral candidates' partisanship influences a market participant as a profit maximizer to adjust their behaviors in response to any possible changes

in government partisanship. While the first two papers deal with individual partisanship under private interests, the third paper focuses on how electoral expectations and uncertainty about government partisanship affect economic actors' investment decisions in financial markets. My dissertation suggests that the expected changes in future government policies may trigger a fast response by market participants.

In fact, the impact of partisan politics on the economy has traditionally been of interest to scholars of political economy. One strand of this literature empirically estimates how different parties redistribute wealth by looking at the reaction of stock returns to politics (Füss and Bechtel 2007; Knight 2006; McGillivray 2003). Partisan models of government (Hibbs 1977, 1987; Alesina et al. 1997; Alesina 1987) argue that parties try to implement their ideologically determined ideal policies. This perspective suggests that parties offer diverse policy platforms and voters choose the party whose policies seem the most beneficial. Consequently, parties which are responsible to voters' interests will pursue economic policies designed to systematically discriminate between industries in a way which is consistent with the preferences of their electoral supporters. On the other hand, the idea of parties redistributing across economic sectors also follows from policy-induced campaign contribution models. According to this perspective, campaign contributions of firms and industry associations are simply investments that affect politically induced future returns.

Combining a rational partisan model of government and policy-induced campaign contribution model suggests that parties should pursue policies which differentially influence economic sectors or a group of firms, chosen strategically in order to optimally benefit their class-defined voters and the business interests from which they received support. These sector-/firm- specific partisan effects should be anticipated by rational investors producing return and return volatility responses to changes in expectations about government partisanship.

In my dissertation, I argue that the effect of campaign platforms on economic actors'

investment decisions varies across industrial sectors or politically oriented firm groups. Given that the presidential candidate's key economic policies strongly influence specific sectors or firms, the candidate's winning probability or unexpected changes in electoral expectations influences economic actors' investment decisions in financial markets.

Organization of the Dissertation

This dissertation contains three parts three papers. Central to my dissertation is partisanship. Partisanship represents the most influential predisposition in political belief systems. Analysis of this predisposition has produced one of the most enduring and significant literature in political science. My dissertation tries to bridge the gap between two perspectives: the socio-psychological model and the rational choice model in voting behavior. The first part investigates how partisans behave in the prediction market. I use a model of an artificial financial market with heterogeneous bounded rational agents that are influenced by partisanship. The second part explores the microfoundations of individuals' behavioral motivations in evaluating political candidates. I use laboratory experiments to examine how partisan biases are moderated by political knowledge and monetary incentives. The third part investigates how electoral expectations about government partisanship affect economic actors' investment decisions in financial markets.

Part one: In this paper, I examine how market participants' partisanship, political information, and monetary incentives influence changes in their beliefs about the electoral outcome in political prediction markets. Using an agent-based model, my simulation results show that participants' initial beliefs about a candidate's winning probability, confirmation biases in accepting information, and monetary incentives strongly increase changes in participants' beliefs about the electoral outcome captured by price volatility in the prediction market. Interestingly, my results also suggest that neither performance-based payment

schemes nor an abundance of political information necessarily increase the stability of participants' beliefs about the electoral outcome.

Part Two: For many voters, party identification functions as an informational shortcut and provides motivated reasons to support their political judgment. This paper has two goals. First, this study captures how partisan bias may affect individuals' political evaluations and behaviors. Second, given different perceptual biases, it also aims to explore how the perceptual gap between Democrats and Republicans can be diminished by focusing on individuals' monetary incentives and political knowledge. Using laboratory experiments, I find that strong partisans with high levels of political knowledge are less likely to vote for the other party's candidate despite unfavorable political information, but monetary incentives may narrow the perceptual gap between Democrats and Republicans. My experimental results suggest that party identification may be either enhanced or weakened through the lens of utility maximization as well as a partisan perceptual screen.

Part Three: This paper investigates the relationship between presidential candidates' policy platforms and equity returns during the 2008 U.S. Presidential Election. Two sources of daily data during the five months leading up to the election are incorporated: sector-specific equity returns and the probability of an Obama victory as implied by prices from the Iowa Electronic Market. For this group of politically sensitive firms, the daily EGARCH estimates demonstrate that policy platforms are capitalized into equity prices. I find that the uncertainty of the election result induces information asymmetry of politically sensitive firms under the Obama/McCain platforms. For the firm level analysis, I examine how the announcement of Palin as the vice presidential nominee affected partisan firms' returns in the stock market by using the event study model. My empirical analysis shows that the public announcement of Palin as McCain's running mate decreases both actual and abnormal returns of politically oriented firms associated with Obama's key policies.

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2 Part One: How do Partisans Behave in the Prediction Market?

Given that political prediction markets provide incentives for participants to “put their money where their mouths are”, it is often suggested that political prediction markets may offer more timely information about electoral outcomes compared to conventional polls. For example, according to Wolfers and Zitzewitz (2004, 108), “In a truly efficient prediction market, the market price will be the best predictor of the event, and no combination of available polls or other information can be used to improve on the market-generated forecast.” Prior to the 2008 New Hampshire Democratic primary, however, the Intrade contract for Obama to win the New Hampshire primary rose as high as 95 cents. Although Intrade still had Obama’s chances of being the Democratic nominee as more than 70 percent on the primary election day (January 8, 2008) ¹, Hillary Clinton won New Hampshire’s Democratic primary, pulling out a stunning victory over Barack Obama in a contest that she had been forecast to lose. This example clearly shows that the “wisdom of crowds”² in the prediction market is not always accurate.

Although some scholars have different opinions about the effect of monetary stakes (Bonner et al. 2000; Camerer and Hogarth 1999; Gerhart and Milkovich 1992; Jenkins 1986; Jenkins et al. 1998; Kohn 1993; Young and Lewis 1995), it is often pointed out that the prediction market is a useful tool to test two of the most important questions in Behavioral economics, American politics, and Political psychology: 1) how political information affects the market and 2) how individuals with different motivations update their beliefs about electoral outcomes. While interpretation of prediction market prices as probabili-

¹Prediction market are designed to elicit a potentially more revealing opinion: who is going to win? In this context, the result suggests that investors believe there is a more than 70 percent probability that Obama will be the Democratic Party’s nominee for president.

²Surowiecki published the book “The Wisdom of Crowds: Why the Many are Smarter than the Few and How Collective Wisdom Shapes Business, Economies, Societies and Nations” in 2004. This book extols the accuracy of collective predictions by the aggregation of information in groups.

ties has been extensively studied in the theoretical literature (Manski 2006; Wolfers and Zitzewitz 2006), however, little attention has been paid to understanding the microfoundations of the information-updating process in the prediction market. Recently scholars have found that people are biased toward their prior beliefs and prone to reject counter-attitudinal information (Edwards and Smith 1996; Taber and Lodge 2006; Nyhan and Reifler 2010). Moreover, these processes may not be alleviated, but instead made more severe, when people are more knowledgeable or sophisticated (Taber and Lodge 2006; Nyhan, Reifler, and Ubel 2013). In particular, partisanship may influence political views through selective perception. (Campbell et al. 1960; Bartels 2002; Taber and Lodge 2006; Jacobson 2006; Gaines et al. 2007; Bullock 2009).

Thus, in the context of political prediction markets, this paper aims to examine how traders' partisanship, political information, and monetary incentives affect the market price using an agent-based simulation. Given that it is hard to use background information about traders in a real market, the simulation method helps to specify how individual actions based on partisan biases lead to different price patterns in the political prediction market.³ In this paper, I consider a simple and illustrative setting, where traders are risk-neutral price takers with finite trading budgets. In my simulation models, I assume that partisans have different prior beliefs and information-updating mechanisms in the prediction market. Given traders' subjective prior beliefs on each candidate's contract, their utility maximization dictates that traders update their expectations about the market price based on subjective prior beliefs and new information. My agent-based model shows how agents with different beliefs learn about the capital gains/losses from their investments using past observations.

The paper is organized as follows. In the next section, I review the existing literature on partisanship and information processing, and then discuss the political prediction

³Unlike human-based experiments where the dynamics of the subject's behavior over many periods are almost never modeled explicitly, agent-based models may easily accommodate complex learning behavior, asymmetric information, heterogeneous preferences, and heuristics.

market. In the following sections, I describe my hypotheses and the agent-based model for simulating biased traders' behaviors and present the simulation results. Finally, I will conclude by discussing the implications of my results for the effect of traders' partisanship on the market price in the prediction market.

Partisanship, Political Information, and Monetary Incentives

One of important puzzles about political behavior is whether or not citizens' attitudes are persistent. Research in political science often considers partisanship the most important attribute accounting for political behaviors. Some citizens strongly identify with a party, seeing their political predispositions as a part of who they are. In this case, party identification may have a great impact on the way in which citizens incorporate political information into their political beliefs. Scholars have claimed that partisanship may serve as a heuristic in the formation of policy opinions, a motivational force preparing one to act on behalf of a party, a cognitive structure that organizes one's understanding of the political world, and a "perceptual screen" that may distort even one's factual beliefs about the world (Campbell et al. 1960; Converse 1969; Gaines et al. 2007).

While some scholars have argued that strong attitudes are formed early in life and strongly influence political behavior (Greenstein 1965; Jennings and Niemi 1981; Jennings, Stoker, and Bower 2001), other researchers have questioned the strength of partisanship as an early-acquired attitude and its stability over the life span (Marsh 1971; Sapiro 1994; Searing, Wright, and Rabinowitz 1976; Vaillancourt 1973; Alwin 1993; Sears 1989). In particular, a rational choice perspective emphasizes individuals' responsiveness to contemporary changes in the political environment (Downs 1957; Page and Shapiro 1992). According to this view, party identification may change over time in response to individuals' policy preferences, their evaluations of party (or candidate) performance and vote choice (Brody and Rothenberg 1988; Fiorina 1981; Franklin 1984; Franklin and

Jackson 1983; Jackson 1975; Page and Jones 1979; Markus and Converse 1979; Abramson 1976,1979a, 1979b; Popkin 1991; Achen 1992; Mackuen, Erikson, and Stimson 1989; Meier 1975). For example, Fiorina (1981) views partisanship as a running tally of all those factors (including past performance) that lead to partisan evaluations. On the other hand, some recent works argue that heritability plays a significant role in partisanship (Settle, Dawes, and Fowler 2009; Fowler, Baker, and Dawes 2008; Fowler and Dawes 2008; Dawes and Fowler 2009). This perspective suggests that variation in the decision to identify with any political party is strongly influenced by genetic factors.

Some scholars have examined what drives fluctuations in variance or instability of public opinion over time by focusing on political uncertainty (Alvarez and Brehm 1995, 2002). When individuals lack relevant information on which to base their judgments, uncertainty can lead to greater instability in their attitudes. In particular, researchers have found information effects on stability in opinion at different times. Recent studies of opinion formation have emphasized the role of political information in making political attitudes. For example, Zaller (1992) has emphasized the role of political information in determining the effect of underlying attitudes:

The impact of people's value predispositions always depends on whether citizens possess the contextual information needed to translate their values into support for particular policies or candidates, and the possession of such information can never be taken for granted (Zaller 1992, 25).

In addition, many studies in political psychology have shown that information may affect attitude-behavior relationships because attitudes tend to be consistent with behavior to the extent that those attitudes are readily retrievable in behavioral situations (Krosnick 1988; Lavine et al. 1996; Alvarez and Brehm 2002). In particular, many studies of opinion formation also have shown that people vary greatly in their attentiveness to political communication and that this variance influences the process of opinion formation (Zaller 1992; Converse 1964, 2000; Alvarez and Brehm 2002). Early work on selective percep-

tion emphasizes the cognitive costs of holding inconsistent views (Festinger 1957). By this account, an individual is motivated by a desire to maintain harmony among his or her beliefs. The most influential statement of selective perception concerns the role of partisan attachments functioning as a “perceptual screen” for information in the electorate (Campbell et al. 1960, 133).

Recent work by Zaller (1992, 241) extends this argument, proposing that “partisan resistance” causes voters to filter out information when it does not conform to their existing political predispositions. Bartels (2002) also finds that partisanship drives fundamental biases in perceptions of various political figures and events. According to Bartels (2002, 138), “partisan bias in political perceptions plays a crucial role in perpetuating and reinforcing sharp differences in opinion between Democrats and Republicans.” In the context of partisanship, social identity theory also maintains that the social groups to which people belong or at least to which they believe they belong comprise an important element of their social self and help them to define who they are (Hogg, Terry, and White 1995; Stets and Burke 2000). This perspective helps to explain how individuals develop and maintain partisan attitudes and behaviors across time (Green, Palmquist, and Schickler 2002; Greene 2004). On the other hand, Achen (1992) and Gerber and Green (1998) propose Bayesian learning models of political attitudes where rational individuals update their evaluations of political parties through a Bayesian assimilation of new information (Bullock 2009).

In contrast, recently scholars have begun to point out that monetary incentives may reduce partisan bias. Prior and Lupia (2008) examine the effect of financial incentives on responses to factual questions about politics. They find that the effect of financial incentives is real but weak. While Prior and Lupia (2008) do not study the effects of monetary incentives on partisan patterns, Prior (2007) and Prior et al. (2015) have investigated the effects of incentives on partisan response patterns to factual questions about politics. When respondents in their experiments are urged to answer correctly under financial incentives,

the treatment conditions reduce errors in answers to political knowledge questions such as the performance of the U.S. economy during the George W. Bush administration.⁴ Bullock et al. (2015) also find that small financial inducements for correct responses may reduce partisan divergence and that these reductions become ever larger when financial incentives are provided for “don’t know” answers. Both studies suggest that partisan divergence should be large without a citizen’s motivation to answer “partisan” questions accurately. A citizen’s perception of the facts may be heavily influenced by her partisan bias. Republicans (or Democrats) often overestimate the rates of unemployment and inflation during a Democratic (or a Republican) presidency. However, partisan bias, as well as political ignorance, can be greatly reduced if respondents are given financial rewards for correct answers.

Despite various works on partisanship, political information, and monetary incentives, the nature and role of partisanship still remains a matter of some debate.⁵ In the context of political prediction markets, in particular, too little is still known about the effect of partisan bias, monetary incentives, and political information on market participants’ beliefs about the electoral outcome beyond the fact that monetary incentives in the efficient prediction market may simply reduce traders’ political or psychological biases. There is significant empirical evidence that prediction markets are efficient mechanisms for aggregating political information. However, my results suggest that neither performance-based payment schemes nor plenty of political information necessarily increase the stability of traders’ beliefs (or prediction accuracy) about the electoral outcome.

⁴According to their experiment results, monetary incentives reduce the rate of error by about 40%.

⁵The debate over the dynamics of partisanship depends heavily on the data and methods selected by researchers to try to detect change. Researchers have mostly used panel data to model the effects of change, but they have also used other types of survey data including rolling aggregate data (Allsop and Weisberg, 1988) and cross-sectional data (Page and Jones, 1979). However, it is difficult to explore partisanship stability using these data because individuals are typically exposed to experiences in a selective fashion and self-reports may be biased and unreliable. In addition, researchers have argued that when measurement error is accounted for in the model, the effects of other variables on partisan change become insignificant (Green and Palmquist, 1990; and Green, Palmquist, and Schickler, 2002).

Partisan Bias and Price Volatility in the Prediction Market

Motivated by financial incentives, traders in prediction markets move prices in the proper direction that leads to more accurate forecasts of future events. Thus, traders in prediction markets are often regarded as non-partisan actors to correct their individual biases through publicly available information and monetary incentives. Given new information, the political prediction market allows us to clearly analyze the public's expectations of political outcomes. The pricing of future contracts in this market provides a continuous measure of the probability of a candidate winning the election. Moreover, the immediacy of online futures markets lets us see exactly how information is incorporated, how quickly it is processed, and how expectations about political events stabilize (Carvalho and Rickershauser 2008). According to supporters of market superiority, "polls are distorted both by their inherent sampling error and their transient reactivity to short-term stimuli that expire before Election Day" (Erikson and Wlezien 2008, 192).

However, the "wisdom of crowds" in the prediction market is not always right. The behavioral finance literature suggests that individual-level biases may affect investors' behaviors and those biases may ultimately lead to irrational market prices (Odean 1998; Barberis and Thaler 2001). Given that volatility is a natural measure of risk in financial markets and often describes the level of uncertainty about future asset returns, this paper focuses on price volatility in the political prediction market in order to capture the instability of traders' beliefs about the electoral outcome. Volatility says nothing about the average but it tells us whether the market price is instable, which may provide us a predictable base regarding traders' variable beliefs about the electoral outcome. If the market price is instable, this means that traders have inconsistent beliefs about the electoral outcome. Thus, traders in the prediction market should make calculations with greater uncertainty.

In the context of political prediction markets, the high level of political uncertainty implies market participants' heterogeneous beliefs about the electoral outcome. Given that a smaller number of people often participate in the prediction market compared to

polls,⁶ high level of political uncertainty often increases differences in traders' beliefs about the electoral outcome. According to heterogeneous beliefs models (Banerjee and Kremer 2010; Hong and Stein 2007), greater uncertainty increases disagreement among market participants about the market outcome and leads opportunistic participants to trade more with others. As a result, the market price becomes more volatile due to the higher trading volume of a stock among participants with heterogeneous beliefs. Thus, I expect that market prices are more volatile when market participants have heterogeneous beliefs about the electoral outcome under greater political uncertainty.

Hypothesis 1: *Market prices become more volatile when traders' initial beliefs about the winning probability are highly heterogeneous.*

In addition, traders' biases in updating political information may also affect the market price in the prediction market. An individual's confirmation bias is one of the most common decision-making biases (Lord, Lepper, and Ross 1979; Evans 1989; Nickerson 1998; Shefrin 2007; Hart et al. 2009; Lodge and Taber 2013; Pouget et al. 2014). A confirmation bias is generally defined as "the seeking out or interpreting of evidence in ways that are partial to existing beliefs." (Nickerson 1998, 175). The primary source of an individual's confirmation bias is her biased assimilation (Bodenhausen, 1988; Lodge and Taber 2013) where she often put much weight on information that confirms her prior views, discounting the disconfirming information. Many works in psychology claim that negative information has a more powerful effect on individuals' behaviors than positive or neutral information (Haller and Norpoth 1994; Baumeister et al. 2001; Bless, Hamilton, and Mackie 1992; Ohira, Winton, and Oyama 1997; Robinson-Riegler and Winton 1996; Soroka 2006; Stanig 2013).

Given that negative information is more informative and influential (Hamilton and Huffman 1971), individuals may weigh negative information more heavily in the predic-

⁶Given some limits on how users can participate, there is a problem of selection bias in particular when individuals select themselves into the market. For example, many political prediction markets employ a double-auction mechanism that appeals to those more familiar with financial markets. In this case, it can be hard for newcomers to join the market. <http://predictwise.com/blog/2015/09/how-cash-affects-prediction-markets>

tion market. Thus, it might be hard for a biased trader to change her initial belief if she puts less weight on political information that does not confirm her prior belief. When there are many biased traders in the prediction market, in particular, market prices are expected to not reflect the rational incorporation of new information over time. I expect that all traders with confirmation biases will not sufficiently incorporate negative information in updating their political beliefs about the electoral outcome. Furthermore, biased traders are unlikely to trade in a manner consistent with rational expectations. When Forsythe et al. (1999) analyzed two markets operated by the Iowa Electronic Market (IEM: the 1988 US presidential election vote-share market and the 1993 Canadian House of Commons market), they found that participants in both markets exhibited individual political biases. Traders bought more shares of candidates they supported and sold more shares of candidates they did not favor (Graefe 2014).

On the other hand, Pouget et al. (2014) argue that unbiased traders may drive prices to be efficient in markets including both biased and unbiased traders. Forsythe et al. (1992) point out that there is a small group of “marginal traders” whose actions are not dictated by their political preferences. Following their logic, those marginal traders without political biases may move the market toward the correct prices. Similarly, some scholars in the field of behavioral finance also have argued that the impact of individual psychological biases on market prices can be mitigated by the presence of unbiased traders (Ganguly, et al. 1994; Camerer 1987, 1992; Kluger and Wyatt 2004).

Hypothesis 2-1: *When partisans dominate the market, market prices are more volatile due to partisans’ confirmation biases.*

Hypothesis 2-2: *Market prices are less volatile when there are more non-partisan participants.*

Lastly, the level of monetary incentives may affect market participants’ beliefs about the electoral outcome. It is often pointed out that financial rewards are a good method for motivating and improving the performance of persons through information updating

(Atkinson, Banker, Kaplan, and Young, 2001; Zimmerman, 2000). In line with this reasoning, many scholars argue that the prediction market predicts elections better than polls (Arrow et al. 2008; Wolfers and Zitzewitz 2008; Berg and Rietz 2006; Berg et al. 2008; Rhode and Strumpf 2004) because prediction markets force market participants to “put their money where their mouths are” (Hanson 1999). On the other hand, people do not have much of an incentive to respond carefully in the polls because the pay-off is not dependent on how well they do. Thus, a group of scholars have argued that prediction markets where traders risk their own money may produce better forecasts than markets without financial rewards.

While many political scientists also agree that monetary incentives lead to greater effort and induce higher output, however, higher stakes might rather degrade performance in the market. Many experiments in both economics and psychology demonstrate that high-powered incentive scheme may reduce some subjects’ ability to perform a task. For example, Ariely et al. (2009) conducted a series of laboratory experiments in India to investigate the effect of monetary incentives in a subject’s performance in the game. When a subject is expected to receive 20 times more than the daily wage, such high-powered incentives did not improve performance. In the political prediction market, excessive monetary incentives may also badly influence the stability of traders’ beliefs about the electoral outcome. Let alone a trader’s risk propensity, market participants are highly vulnerable to new information under excessive monetary incentives. As long as political information is not favorable only to one candidate, market prices are more volatile because traders are highly sensitive to political information so as not to lose their monetary rewards.

Hypothesis 3: *Given excessive monetary incentives, market prices are more volatile because traders are highly sensitive to political information.*

Agent-based Models

In this paper, I use Agent Based Models (ABMs) for the empirical analysis. Since it is hard to use personal background information about market participants in the real political prediction market, the simulation method is a useful technique to examine how market participants' different beliefs and monetary incentives affect the price pattern in the political prediction market. ABMs have been extensively applied to simulate agents' behaviors and interactions among different agents within a given system (Agarwal et al.2002; Bousquet and Le Page 2004; Parker et al. 2003; Sengupta and Sieber 2007). In ABMs, individual agents have their own set of assigned attributes and rules,⁷ which determines agents' behaviors within the ABM system. Agents are often assumed to have different preferences and beliefs about the environment and follow different strategies when making their decisions (Parker et al. 2008). ABMs allow us to observe how individual agents' behaviors affect the system as a whole and whether any emergent structure may develop within the system. While examining different rule sets in conjunction with the corresponding structure, ABMs show how small-scale changes may affect large-scale outcomes within the system. As a result, we can better understand and predict the development and evolution of systems of interest.

Agent-Based Models for Political Prediction Markets

Given that political prediction market prices reflect participants' real-time expectations about the election outcome, it is often suggested that the political prediction market provides valuable information relevant to electoral uncertainty (Herron 2000; Knight 2006; Fowler 2008; Mattozzi 2008). Unlike conventional markets, prediction markets pay out returns conditional on whether or not a specific event occurs (Carvalho and Richkershauser 2008). Participants trade in contracts whose payoffs are contingent on uncertain future events. Market participants may win or lose money according to their forecasting or trad-

⁷Those rules can be deterministic or probabilistic in ABMs. Thus, ABMs allow for a great deal of flexibility.

ing performance.

In the ideal prediction market, market prices can be interpreted as the probability that the underlying event will occur. For example, if a candidate has no chance of winning, then the market price would be zero since there will be no payout. In the real market, however, strong partisan traders might want to hold shares with no chance of a payout. On the other hand, non-partisan traders should put intense downward pressures on the price if it were to rise much. Likewise, there is a strong connection between trading prices and traders' beliefs about who will win the election in the political prediction market. Thus, it is important to track changes in market prices because trading prices may reveal market expectations of the likelihood of an event occurring.

In the context of political prediction markets, ABMs allow me 1) to analyze how partisan and non-partisan traders' different beliefs and information processing affect the market price; and 2) to model under what circumstances traders' beliefs about the electoral outcome become more unstable when changing the rules of trader behavior.⁸ Taken together, ABMS make it possible to effectively simulate the traders' possible behavior within the prediction market.

My simulation model deals with the political prediction market with heterogeneous bounded rational traders and no-arbitrage. This prediction market is designed with two contracts, each of which corresponds to a discrete event: the Democratic Party candidate will win the presidential election (D) and the Republican Party candidate will win the presidential election (R).⁹ Traders have two choices, to buy and sell, and subjective prior beliefs about the electoral outcome. I assume that the number of traders is of finite size N and is divided into three groups or factions, of n_D Democrats, n_R Republicans, and n_I Independents ($n_D + n_R + n_I = N$). Players interact at discrete time periods t according to

⁸In the standard model, prices are often exogenous and trading actions are endogenous. On the other hand, the agent-based model determines prices endogenously from behavioral rules. In addition, agent-based modeling can be used to simulate the market over time, as opposed to only the static analysis provided by the standard model.

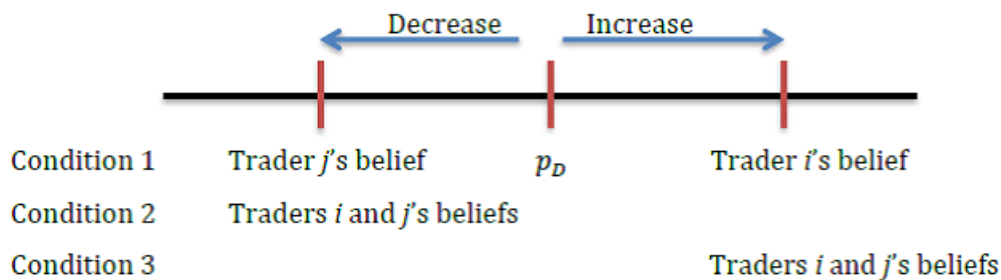
⁹In practice, market is created with mutually exclusive and unambiguous events, such as "the Democratic Party candidate will win the 2016 U.S. presidential election."

the one-shot game. I also assume that there is no-arbitrage. Thus, if the market prices of D and R are p_D and p_R , market prices satisfy the following condition: $p_D + p_R = 1$. Given that prices are exogenous and traders are price-takers, market participants as utility maximizers make their investment decisions based on the exogenous prices and their individual beliefs about the future election outcome. Since a participant's budget is assumed to be affected only by the political event, there is no hedging motive for trading the contract.

In my simulation, market participants continuously observe market activities, update their beliefs, and adjust their positions accordingly. Participants form their base price based on their initial beliefs about the election and they attempt to buy (sell) if the base price is higher (lower) than the market price because the stock is undervalued (overvalued) from their perspective. On the other hand, participants stop trading when either the market price is equal to their base price or they run out of cash or stock.

Figure 1 shows how agents make decisions to buy or sell $D(R)$ based on their beliefs. If trader i expects p_D to increase and trader j expects p_D to drop, trading occurs between two participants: trader i tries to buy D from trader j and trader j tries to sell D to trader i within the budget limits (Condition 1). However, if traders i and j have the same beliefs about the expected results, such as an increase or a decrease in p_D , trade does not occur (Conditions 2 and 3).

Figure 1: Positions of Traders' Beliefs



In mathematical terms, trader i with budget y ¹⁰ has a subjective belief π_i that the Democratic Party candidate will win the presidential election, and a belief $(1 - \pi_i)$ that the Republican Party candidate will win the presidential election. To maximize subjective expected utility, trader i trades contract, x_i , as follows:

$$\text{MAX} E U_{\{x\}i} = \pi_i \ln(y + x_i(1 - p_D)) + (1 - \pi_i) \ln(y - x_i p_D)$$

$$x_i = \frac{y}{(1 - p_D)p_D} (\pi_i - p_D)$$

Taken together, in this prediction market: 1) a trader's demand is zero when price (p_D) equals her belief (π_i); 2) Given her budget constraint (y), a trader's demand increases linearly with her belief; 3) when a trader's risk increases, her demand becomes smaller; 4) a trader's demand for contracts rises proportionately with her initial budget (y); 5) the market price is between 0 and 1.

On the other hand, the prediction market is in equilibrium when demand equals supply:

$$\int_{-\infty}^{p_D} y \frac{\pi - p_D}{p_D(1 - p_D)} f(\pi) d\pi = \int_{p_D}^{\infty} y \frac{p_D - \pi}{p_D(1 - p_D)} f(\pi) d\pi$$

If belief and budget are independent, then this implies,

$$\frac{y}{p_D(1 - p_D)} \int_{-\infty}^{p_D} (x - p_D) f(\pi) d\pi = \frac{y}{p_D(1 - p_D)} \int_{p_D}^{\infty} (p_D - \pi) f(\pi) d\pi$$

$$p_D = \int_{-\infty}^{\infty} \pi f(\pi) d\pi = \bar{\pi}$$

Thus, market prices are equal to the mean belief among traders. Put another way, traders' beliefs reflect subjective, but noisy, signals of the likelihood that the Democratic Party candidate will win the presidential election. Given these subjective beliefs, traders maximize their utilities subject to their budget constraints.

¹⁰Budget y includes cash and the number of Democratic and Republican contracts owned.

Market Price Updating Mechanism

In my simulation, political information is critical to market prices. I assume that new political information influences the market price based on the following equation:

$$p_{D,t} = p_{D,t-1} + wS_{D,t} + Z$$

In this equation, $p_{D,t}$ is the price of contract that the Democratic Party candidate D will win at time t , $p_{D,t-1}$ is the price of contract that the Democratic Party candidate will win, D at time $t - 1$, w is the adjustment weight for new information, and $S_{D,t}$ refers to a signal provided by new information relevant to the contract's value. I incorporate either the news type toward the election candidate or the size of news effect (the sensitivity to new information¹¹) by changing the size of $S_{D,t}$. For example, the news type is taken in binary terms as either being good (+1) or bad (-1) for Democrats.¹² Meanwhile, the weight parameter (w) measures the selective perception of information. It captures the extent to which either favorable or unfavorable information is misinterpreted. For example, when w is greater than 1, this means that Democratic participants tend to overrate the credibility of favorable information about the Democratic Party candidate. Similarly, when w is less than 1, Democrats tend to underrate bad information about the Democratic Party candidate.¹³ On the other hand, $w=1$ implies the lack of this selective perception. Finally, Z measures a risk premium or an investment incentive (penalty) by performance. This is relevant to a significant portion of investment profits. The idea behind the risk premium is that higher rewards correspond with greater risks. For analytical convenience, I use the same amount

¹¹The sensitivity to new information is set to between 0.01 and 0.7. I assume that the traders with the same party identification have same sensitivity to new information.

¹²This is a much simpler asset pricing model than Rabin and Schrag (1999) and Pouget et al. (2014), but it embraces their assumption that the market price evolves as a result of initial beliefs being established and then updated as a result of traders receiving, weighing and incorporating new information into their beliefs about an asset's true value.

¹³If selective perception consists of exaggerating the good news provided by favorable information, w will be greater than 1. If selective perception consists of giving an unduly favorable interpretation to bad news, w will be less than 1.

of a risk premium (0.05) when trading occurs.

Traders' Subjective Prior Beliefs

In my simulation, I incorporate traders' various subjective prior beliefs by using the different probability distributions of initial beliefs. I assume that the traders hold initial perceptions on each candidate's winning probability before participating in the prediction market. Such an initial belief is randomly assigned based on a trader's party identification: Democrat, Independent and Republican.¹⁴

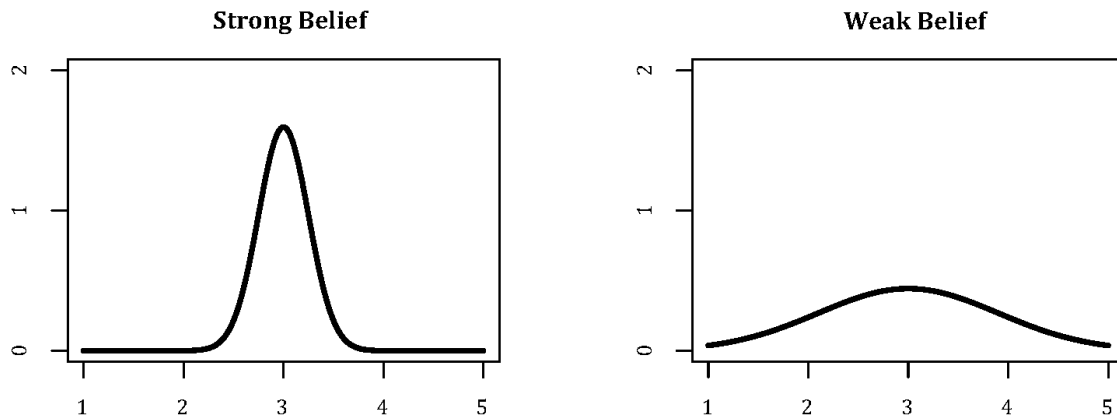
I also assume that market participants' prior beliefs about the electoral outcome are normally distributed (Achen 1992; Bartels 1993, 2002; Gerber and Green 1999; Husted, Kenny, and Morton 1995; Gerber and Jackson 1993; Zechman 1979).¹⁵ Suppose that a market participant has an initial belief b about a candidate's winning probability. I assume that this belief is normally distributed: $b \sim N(\mu, \sigma^2)$. The variance of this belief σ^2 captures the strength of this initial belief. Thus, the variance of an initial belief refers to an agent's party loyalty: the lower the variance, the stronger partisanship a trader has.

In Figure 2, for example, both panels show the normal distributions with the same mean of 3. The distribution in the left-hand panel has a variance of .25. The trader who holds this belief can be a strong partisan. By contrast, the distribution in the right-hand panel has a variance of 1. The person who holds this belief is relatively a weak partisan. This partisan trader's belief might be around 1 or 5 that is more distant from 3. Thus, the use of different variances allows us to compare market behaviors between strong partisans and weak partisans in the political prediction market.

¹⁴I assume that while Independents engage in essentially unbiased information updating, partisans (Democrats and Republicans) exhibit systematic bias. This assumption provides partial support for the "Michigan Model" of political behavior including the argument that party identification "raises a perceptual screen through which the individual tends to see what is favorable to his partisan orientation" (Campbell et al 1960, 133).

¹⁵Manski (2006) also holds that belief distributions are unimodal and symmetric. Alvarez and Franklin (1996) argue that as a normal distribution is inherently unbounded, a beta distribution is a better alternative. To overcome this problem, I use a truncated normal distribution which is bounded between 0 and 1. By doing so, I can keep the benefit of a normal distribution: since the mean and variance are independent of one another, it is possible to increase the variance without altering the mean.

Figure 2: The Variance of a Trader's Initial Belief

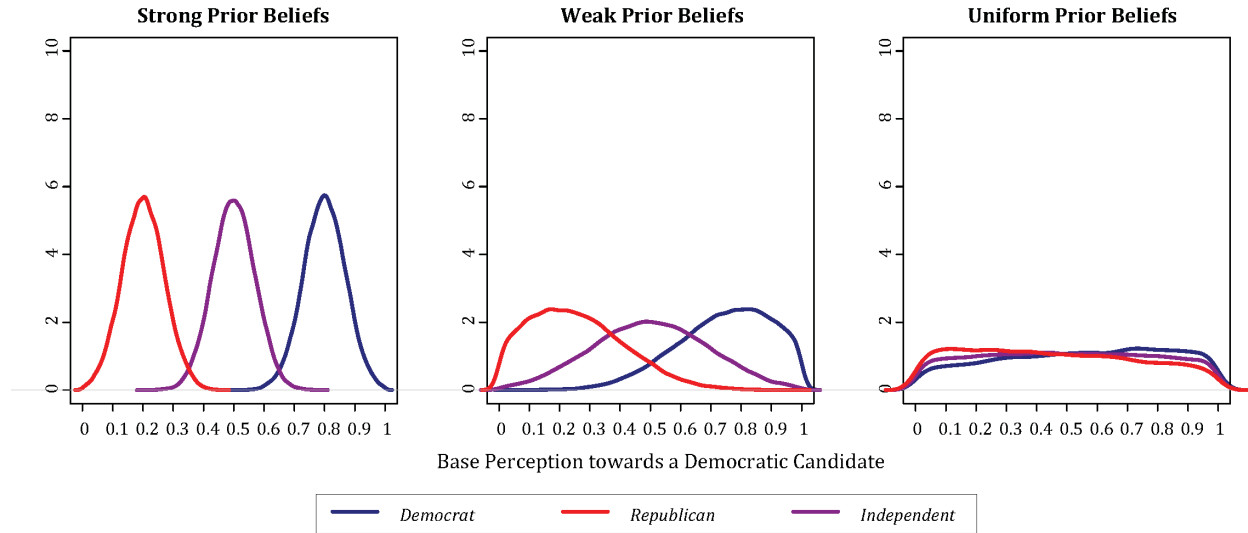


In this simulation, I use three types of subjective prior beliefs Strong, Weak, and Uniform using different variances on each candidate's winning probability. Each type represents three partisan groups: Democrats, Independents and Republicans, all of which are depicted in Figure 3. Each partisan group has a same mean (perception) over three different types of beliefs: Democrat (0.8), Republican, (0.2), and Independent (0.5).

I assume that a strong belief group's (or strong partisans') prior beliefs have a small variance (0.07) and that this group has a high level of selective perception in updating new political information. On the other hand, a weaker belief group's (or weak partisans') beliefs have a relatively large variance (0.2). Traders in this group have less severe selective perception problems and they change initial beliefs more easily from new political information. Lastly, uniform priors implies that both partisan and non-partisan traders have great uncertainty about the electoral outcome. Thus, this belief has a quite large variance (0.7) and its probability distribution flattens out toward the uniform. Regardless of each trader's partisanship, they tend to perceive each candidate's winning probability in an objective way and to incorporate new information efficiently without any selective perception. In this case, there is the greatest disagreement of initial beliefs about the electoral

outcome among market participants.

Figure 3: Three Types of Prior Beliefs about the Winning Probability of a Democratic Candidate



Baseline Model

Table 1 summarizes baseline model assumptions. To maintain comparability, most parameters should be held constant throughout the simulation.

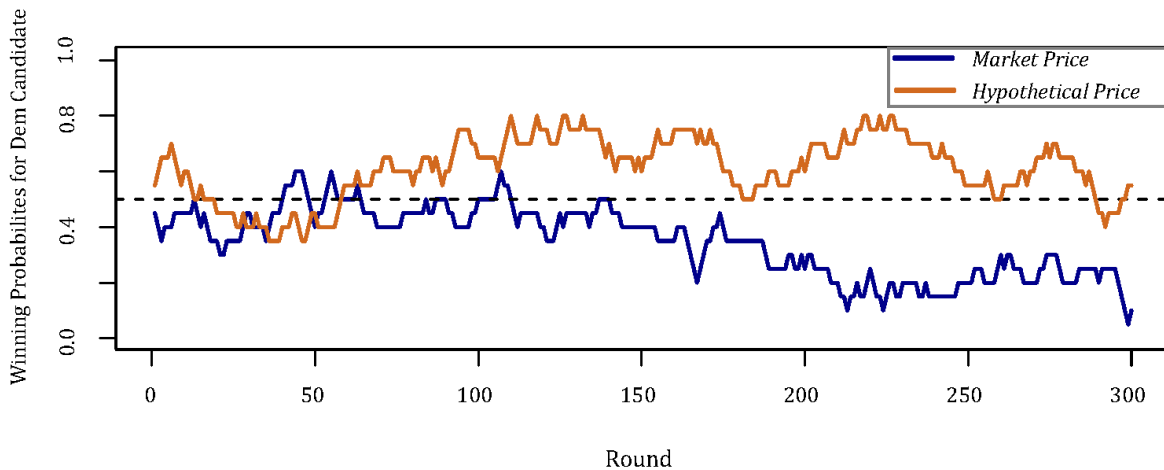
Figure 4 (Run 1) shows the price difference between two markets. In the first market (Market Price), market participants are willing to trade more when they have more confidence in the Democratic Party candidate’s success. In the second market (Hypothetical Price), on the other hand, the contract price for the Democratic candidate is calculated by the previous round’s price and new information. In this hypothetical scenario, all participants have the same prior beliefs and there is no trade between participants. Thus, each participant adjusts her belief only depending on new political information. The price gap happens due to the transaction among traders with different prior beliefs. This shows that both traders’ initial beliefs and their trading activity can differently influence the market price even if there is no political bias in updating new information.

Table 1: Baseline Model Assumptions

Parameter	Value
Number of Traders	100000
Simulation Runs	300
Democrats Ratio*	0.3
Republican Ratio*	0.26
Independent Ratio*	0.44
Prior Subjective Belief Mean	Dem (0.8) Ind (0.5) Rep (0.2)
Prior Subjective Belief Variance	0.2 (Weak prior belief)
Initial Democratic Party Candidate Price	0.5
Initial Republican Party Candidate Price	0.5
Number of Democratic Party Candidate Contracts	100
Number of Republican Party Candidate Contracts	100
Cash	100
Information Flow Rate	0.5
News Effects Rate	0.05
Asymmetric Information Bias Weight	1 (No Selective Perception bias)
Risk Premium	0.05

*With regard to the ratio of party identification, this ratio is based on Gallup Poll result in 2014. <http://www.gallup.com/poll/180440/new-record-political-independents.aspx>

Figure 4: Market Dem Candidate Price vs. Hypothetical Dem Candidate price



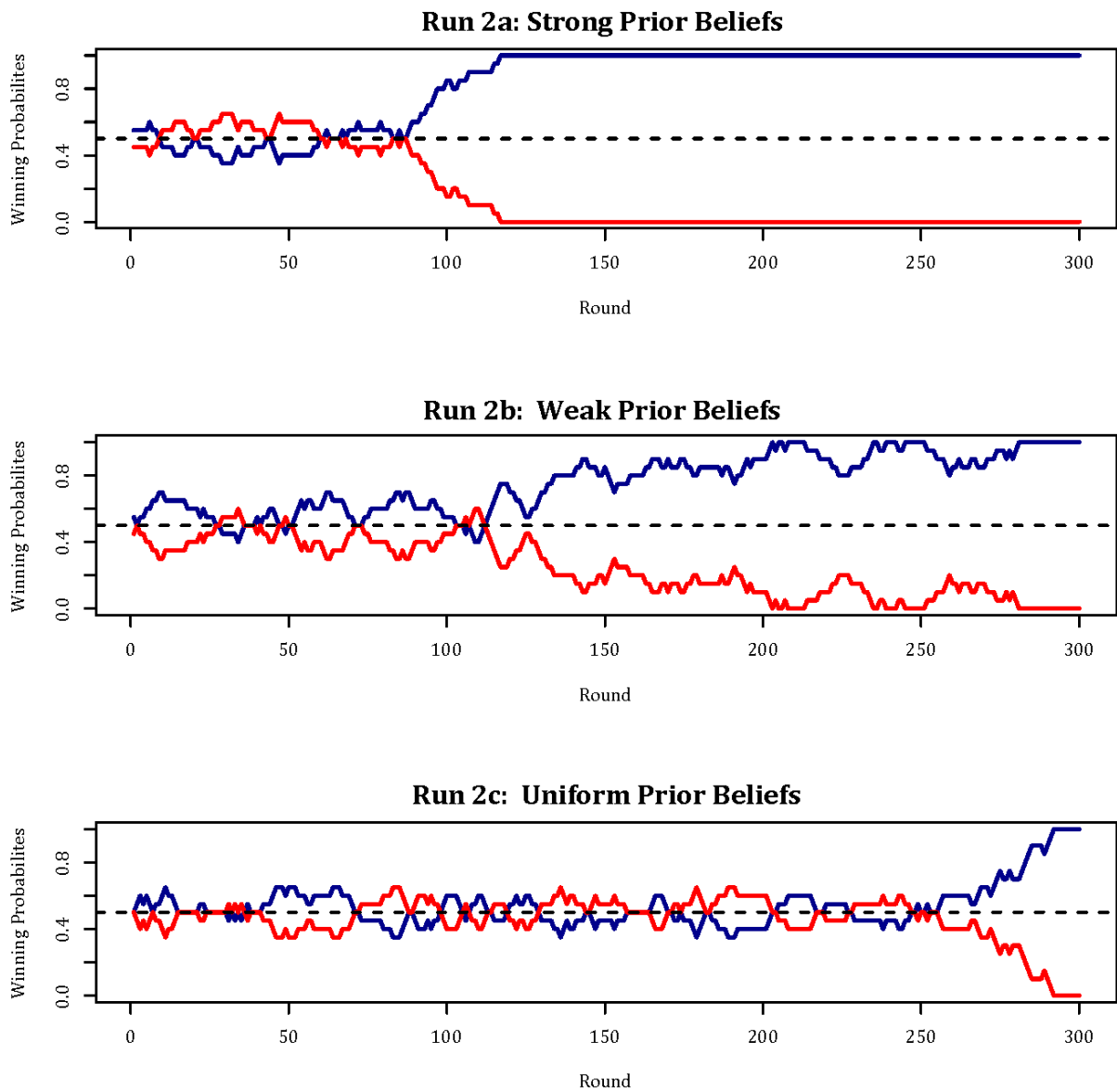
Simulation Results

To capture the instability of traders' beliefs about the electoral outcome, this section deals with the price volatility in the political prediction market. Why should we care about the short-term dynamics of price volatility? The price volatility indicates the tendency of the price to rise or fall drastically in a short period of time. Thus, in the context of political prediction markets, it is important to capture the price volatility because volatility shows the instability of beliefs over time. In this section, I use two measures to estimate 1) the price volatility in the prediction market by calculating standard deviation of the closing prices and 2) the price change by identifying structural breaks in market price using a Bayesian change point model (Killick and Eckley 2014).¹⁶ Generally, the more volatile the contract, the more its price tends to change over a specific time period. However, as volatility does not take into account whether the contract's price has gone up or down, I also measure the price change to check its direction.

Figure 5 shows how a trader's subjective prior belief affects the market price. To capture the effect of a trader's prior belief on price instability, I assume that there is no confirmation bias in updating political information. Thus, new information leads to changes in price through unbiased information processing ($w=1$). Figure 5 shows that when traders have weaker prior beliefs about the electoral outcome, they are swayed more by new information and have more chances to adjust their beliefs through transactions in the market. Thus, the market price becomes more volatile due to the higher trading volume of a stock among participants with heterogeneous beliefs. This simulation result supports Hypothesis 1. According to a trader's prior beliefs, each panel shows different price patterns. The higher subjective prior beliefs are, the faster the price convergence occurs.

¹⁶A volatile contract can also be considered higher risk because its performance may change quickly in either direction at any moment. The standard deviation of a contract price considers this risk by measuring the degree to which the contract price fluctuates in relation to its mean return, the average return of a contract price over a period of time.

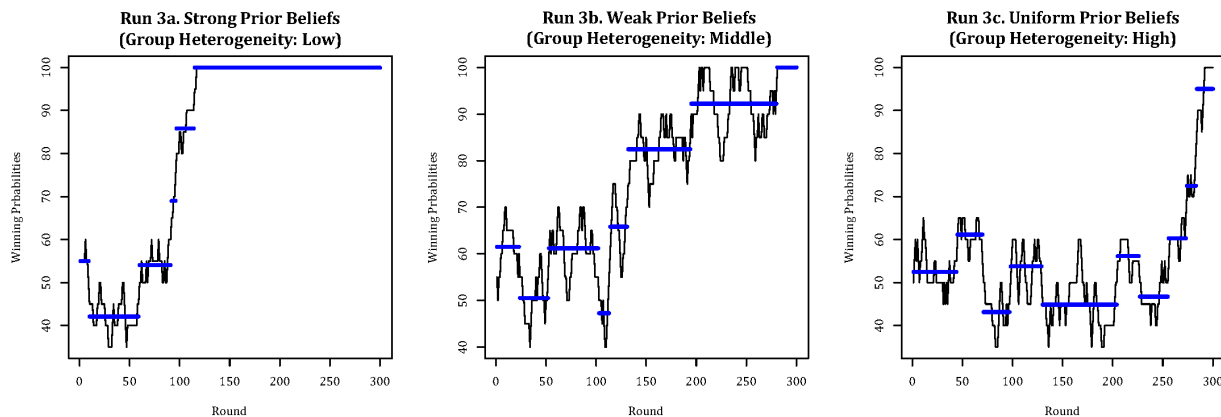
Figure 5: Traders' Initial Beliefs and Market Price



Subjective Prior Beliefs	Run 2a: Strong Prior	Run 2b: Weak Prior	Run 2c: Uniform Prior
Information Occurrence Rate	0.5	0.5	0.5
Democrats Ratio	0.3	0.3	0.3
Republicans Ratio	0.26	0.26	0.26
Independent Ratio	0.44	0.44	0.44
Prior Beliefs Variance	0.07	0.2	0.7
News Effects	0.05	0.05	0.05
Asymmetric Information Bias	1	1	1
Risk Premium	0.05	0.05	0.05

In Figure 6, I use a Bayesian change point model to capture the structural breaks in the market price. The solid blue lines indicate the number of breaks in the market price identified by the model. A change point analysis also shows that there are more structural breaks when a trader has a weaker prior belief. There are six breaks when a trader has a strong prior belief. On the other hand, more than ten breaks are observed when I assume a uniform prior belief. Given that high levels of political uncertainty increase disagreement among market participants about the electoral outcome, traders with heterogeneous beliefs are more sensitive to political information and also have more incentive to trade. Thus, the market price becomes more volatile due to frequent trading activities among heterogeneous participants.

Figure 6: Traders' Initial Beliefs and Changes in Price



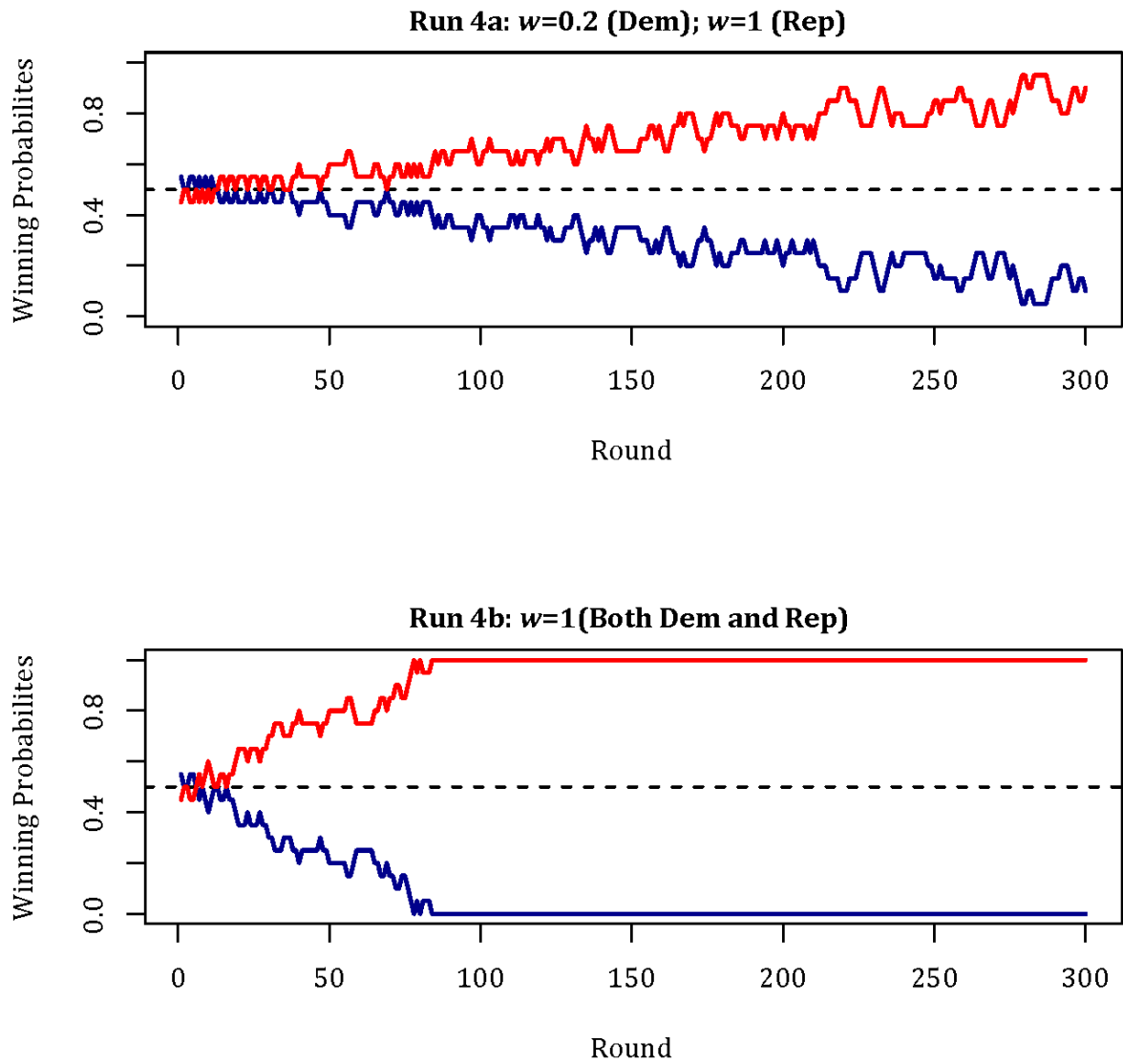
In addition to a trader's initial belief, I have argued that a trader's confirmation bias may also affect the market price. In this simulation, I assume that there are only strong partisan traders in the market (Strong Democrats and Strong Republicans) and also that each type of trader has different updating information schemes. For analytical convenience, I offer only negative information about the Democratic candidate over all rounds. Given different information updating between Democrats and Republicans, Run 4a (Figure 7) shows that negative information increases price volatility. This is because strong Democrats are less likely to incorporate such information into their beliefs ($w=0.2$) and strong Republicans willingly adopt the new information ($w=1$).

Given negative information about Democratic contract, strong Republican traders believe that the Republican candidate will win based on this information. On the other hand, strong Democrat traders may be more reluctant to accept the same information unlike strong Republican traders. Thus, most strong Republican traders are eager to buy the Republican contracts, whereas some strong Democrat traders are still willing to sell them. Given partisan traders' biased information-updating, the simulation result shows that new information may not always help different participants' beliefs converge.

In another simulation, I assume that there is no asymmetric partisan bias in receiving political information. In Run 4b (Figure 7), when both partisans incorporate negative information without selective perception ($w=1$), the market price becomes less volatile. Thus, Figure 7 confirms Hypothesis 2-1: Market prices are more volatile due to partisans' confirmation biases. On the other hand, strong prior beliefs do not increase price volatility as long as traders may incorporate new information efficiently.¹⁷

¹⁷In this case, even if strong prior beliefs cause small change in volatility, this will be insufficient to swing the sign of the trader's decision.

Figure 7: Varying Asymmetric Information Bias with Partisans

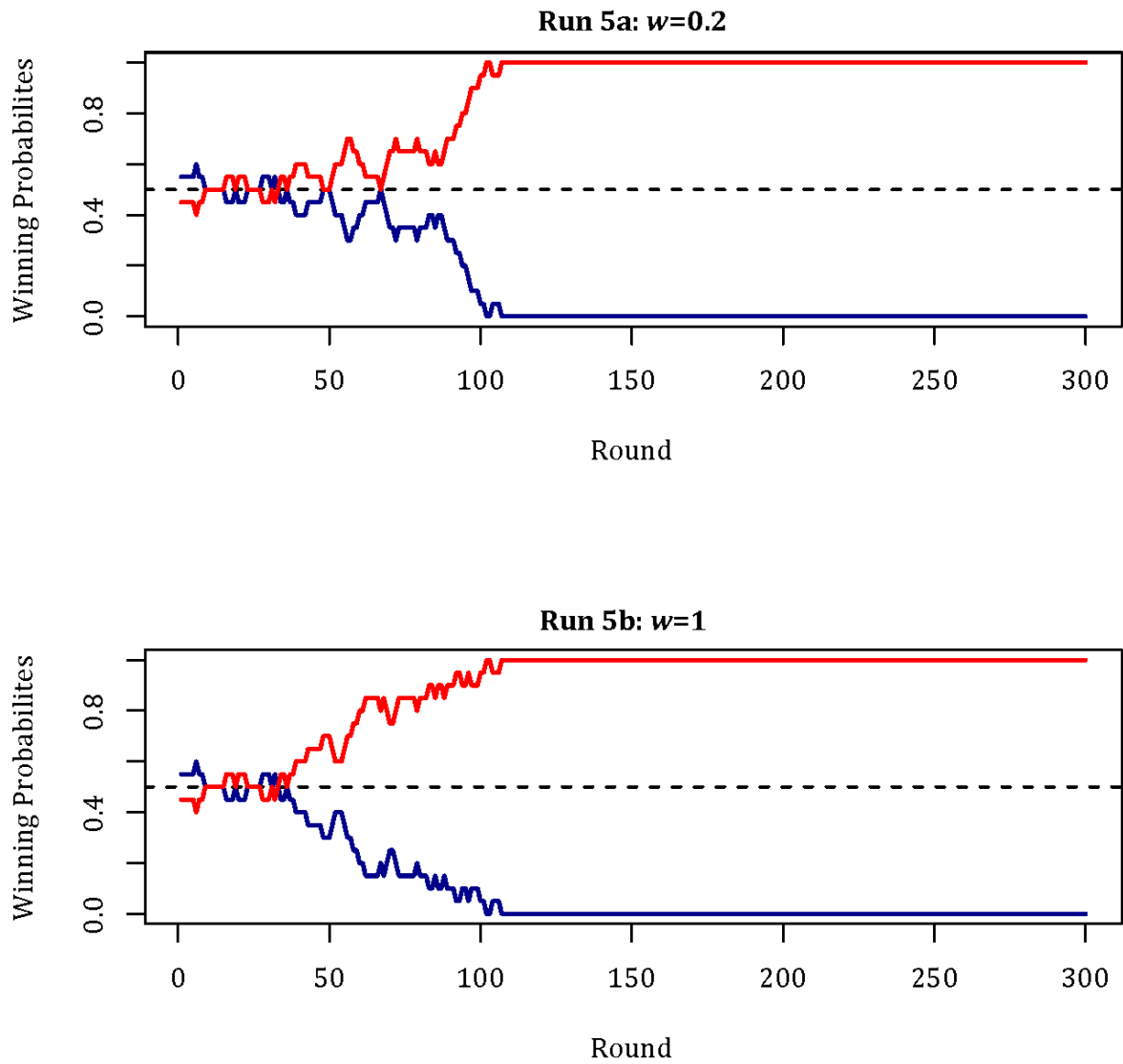


With Only Partisans	Run 4a: Asymmetric Information Bias	Run 4b: No Asymmetric Information Bias
Information Occurrence Rate	0.5	0.5
Democrats Ratio	0.5	0.5
Republicans Ratio	0.5	0.5
Prior Beliefs Variance	0.07	0.07
News Effects	0.05	0.05
Asymmetric Information Bias Weight(w):	0.2	1
Risk Premium	0.05	0.05

In a different simulation, I assume that there are not only partisan traders but also non-partisan traders without confirmation biases in the market. Both Runs 5a and 5b (Figure 8) and Runs 6b, Runs 6c, and Runs 6d (Figure 9) present relatively similar patterns. This is because Independents, as utility maximizers, have less biases in interpreting new information. These results suggest that when there are not a few non-partisan traders, neither strong prior beliefs nor asymmetric information bias increases price volatility thanks to non-partisan traders.¹⁸ As in existing works on the prediction market, my simulation also suggests that the impact of individual biases on market prices can be mitigated by the presence of unbiased traders and those unbiased traders may move the market toward the correct prices (Camerer 1987, 1992; Forsythe et al. 1992; Ganguly et al. 1994; Kluger and Wyatt 2004; Pouget et al. 2014). This simulation shows that Independent traders play an important role in driving prices to efficient levels while profiting from the behaviors of biased partisan traders. The results are consistent with Hypothesis 2-2.

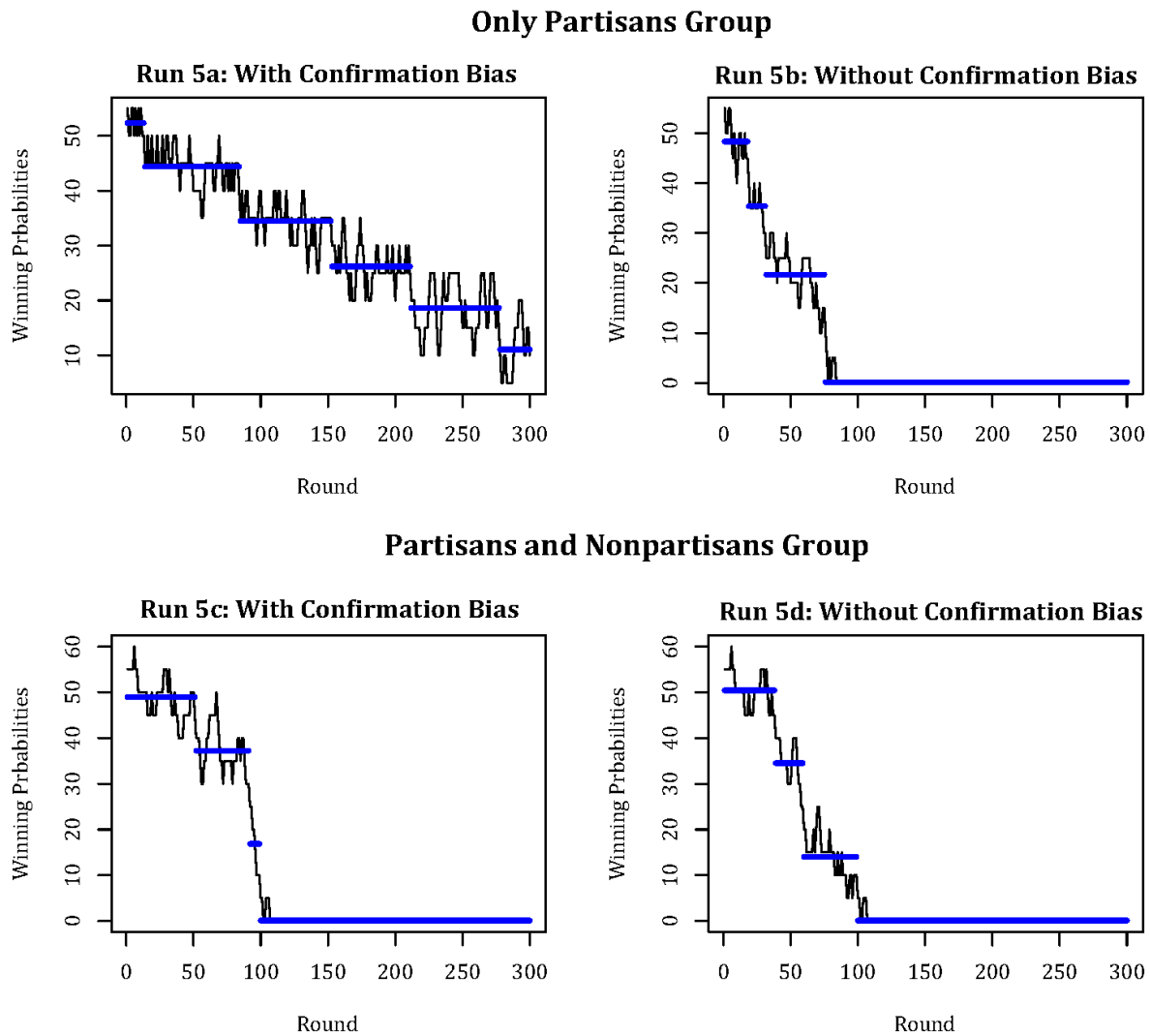
¹⁸In economics, scholars call them marginal traders, who do not suffer from bias when evaluating stock prices. They frequently make trades close to the current market price, thereby adjusting the price according to their information (Forsythe et al. 1992, 1999).

Figure 8: Confirmation Bias and Market Price (Partisans vs. Non-Partisans)



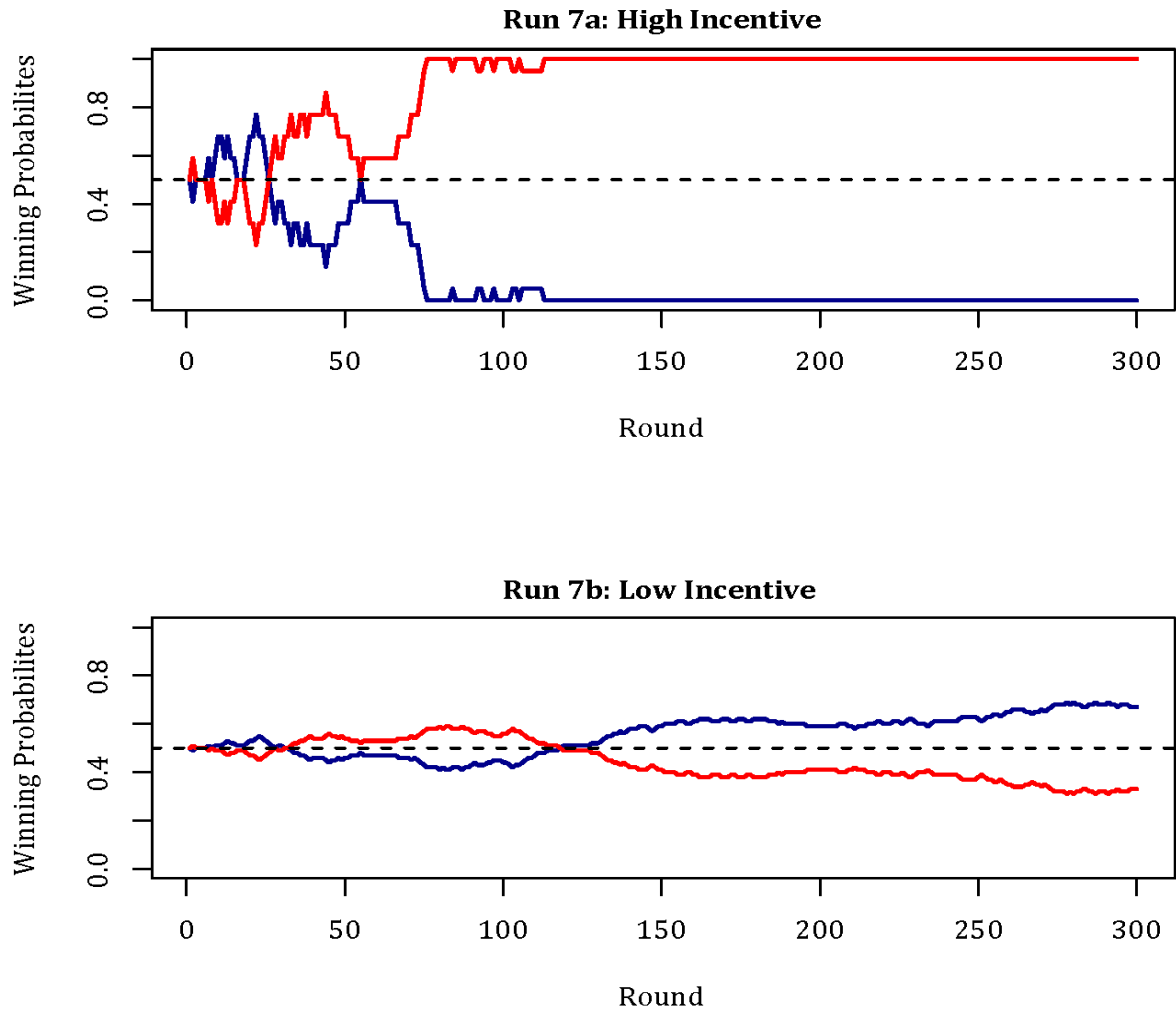
With Partisans and Non-Partisans	Run 5a: Asymmetric Information Bias	Run 5b: No Asymmetric Information Bias
Information Occurrence Rate	0.5	0.5
Democrats Ratio	0.3	0.3
Republicans Ratio	0.26	0.26
Independent Ratio	0.4	0.4
Prior Beliefs Variance	0.07	0.07
News Effects	0.05	0.05
Asymmetric Information Bias Weight (w)	0.2	1
Risk Premium	0.05	0.05

Figure 9: Confirmation Bias and Changes in Price



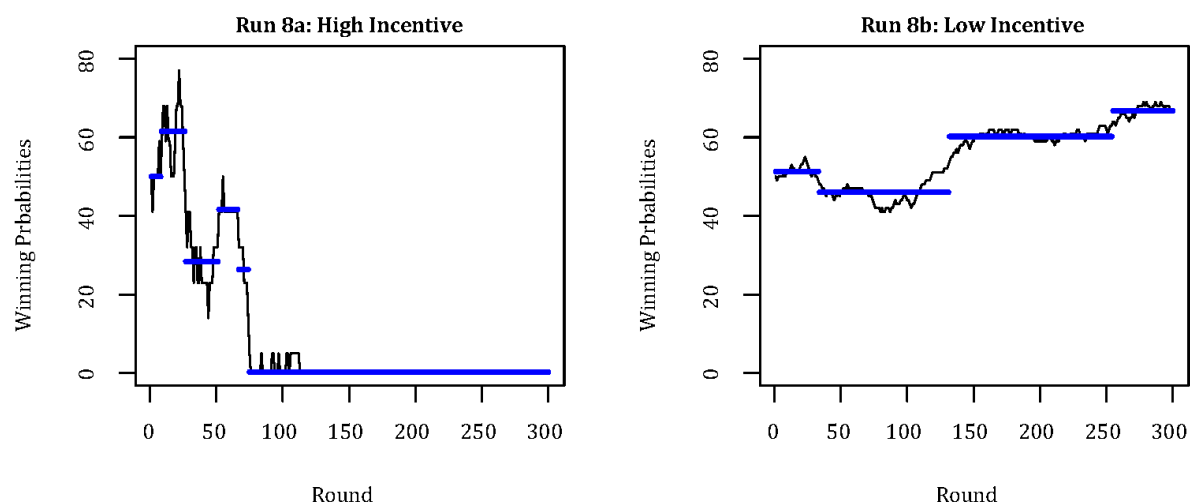
Lastly, Figure 10 shows how the market price is influenced by a trader's monetary incentive (risk premium). Under the high-stakes environment (Run 7a), the price becomes volatile from the early rounds, and then the price quickly converges ($p_D=0$ since 114th Round, SD=0.192). Under the low-stakes environment (Run 7b), in contrast, the prices are very stable and move between 0.41 and 0.69 (SD=0.08). We can confirm this volatility difference in Figure 11. When excessive monetary incentives are offered, market participants have strong incentives to update new information, leading to a higher level of price volatility. It is often said that when the risk premium is too small, the market may be bound to yield inadequate results because traders lack sufficient incentive to ensure that their decisions are rigorous. However, the result also implies that a high-stakes market might not produce an accurate prediction because traders are highly sensitive to political information.

Figure 10: Monetary Incentives and Market Price



Incentive	Run7a: High Incentive	Run 7b: Low Incentive
Information Occurrence Rate	0.5	0.5
Democrats Ratio	0.3	0.3
Republicans Ratio	0.26	0.26
Independent Ratio	0.4	0.4
Prior Beliefs Variance	0.2	0.2
News Effects	0.05	0.05
Asymmetric Information Bias	1	1
Risk Premium (Z)	0.1	0.01

Figure 11: Monetary Incentives and Changes in Price



Conclusion

In this paper, I have examined how traders' partisanship and monetary incentives affect the market price in the political prediction market using an agent-based simulation. Recently, scholars have found that partisan bias, as well as political ignorance, can be reduced if respondents are given financial rewards. Following this logic, political prediction markets may offer more timely and sincere information about the public's beliefs about electoral outcomes because markets provide incentives for participants to "put their money where their mouths are."

However, I find that three key factors may influence the price volatility in the political prediction market: 1) a trader's initial belief about the electoral outcome, 2) a trader's confirmation bias in accepting new information, and 3) a trader's monetary incentive in the prediction market. First, when market participants have heterogeneous beliefs about the electoral outcome, they will trade more with other participants with different beliefs. The market price becomes more volatile due to the higher trading volume among hetero-

geneous participants. Second, biased traders may put much weight on information that confirms their prior views and less weight on disconfirming information. The simulation result also suggests that market prices are more volatile when there are many partisans with confirmation biases. On the other hand, the presence of Independent traders mitigates the effect of individual partisan biases on the market price. Lastly, excessive monetary incentives lead to more volatility in market prices. Market prices are more volatile because traders are highly sensitive to political information. At the same time, market prices quickly converge after fluctuations during the early rounds.

In my agent-based model, I assume that a trader's initial belief, political knowledge, information processing, and monetary incentives are essential factors that influence the accuracy of prediction markets. By distinguishing non-partisan agents from partisan agents in a prediction market context, I have shown that the "wisdom of crowds" in the prediction market is not always accurate, unlike ideal prediction markets with fully rational agents. In the context of prediction markets, my simulation results suggest that a trader's partisan characteristics strongly influence the price pattern. Some market participants may discredit political information running counter to their prior beliefs. Partisan traders may hold rather than sell contracts for their favored candidate in spite of bad information about the candidate.

In addition, my agent-based model allows me to examine how news is absorbed into the markets and when market participants' beliefs converge regardless of individual partisanship. My simulation suggests that partisans behave differently when they get bad information for their favored candidate. However, partisans may also behave differently when they receive good or neutral information. In my future study, those scenarios will also be included to fully understand the effect of partisan bias on political evaluations of candidates.

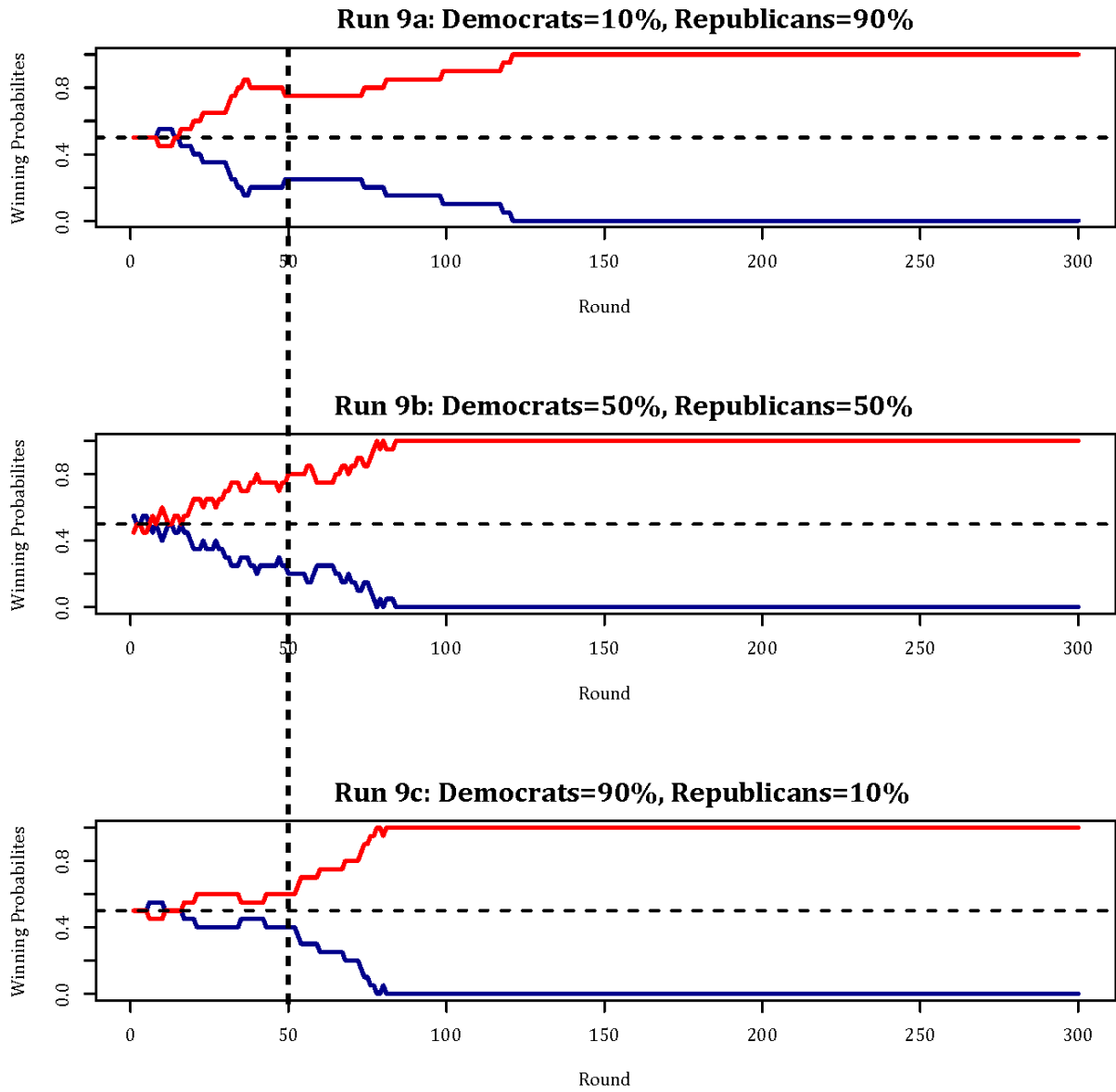
Appendix

Variations in Other Parameters

Variation in Faction Size

In order to understand whether and how the ratio of partisan groups affects the market price, assume that only negative information for the Democratic Party candidate is prevalent and there are only two partisan groups (Democrats and Republicans) in the market. Runs 9a and 9c depict that one partisan group dominates the prediction market (90%), while in Run 9b both partisan groups are divided equally (50%). In Figure 12, regardless of whether or not a certain partisan group dominates the market, the price convergence patterns are quite similar, except in the early trading rounds. Interestingly, when Democrats dominate the market (Run 9c), the market causes them to adjust too slowly to new information. In terms of the magnitude of the Democratic candidate's contract prices change, Run 9c's Democratic contract prices (blue line) move a little bit around the original price until Round 50 compared to Run 8a or Run 8b. This result proves that who dominates the market can be an important factor to influence the market price.

Figure 12: Varying Faction Size



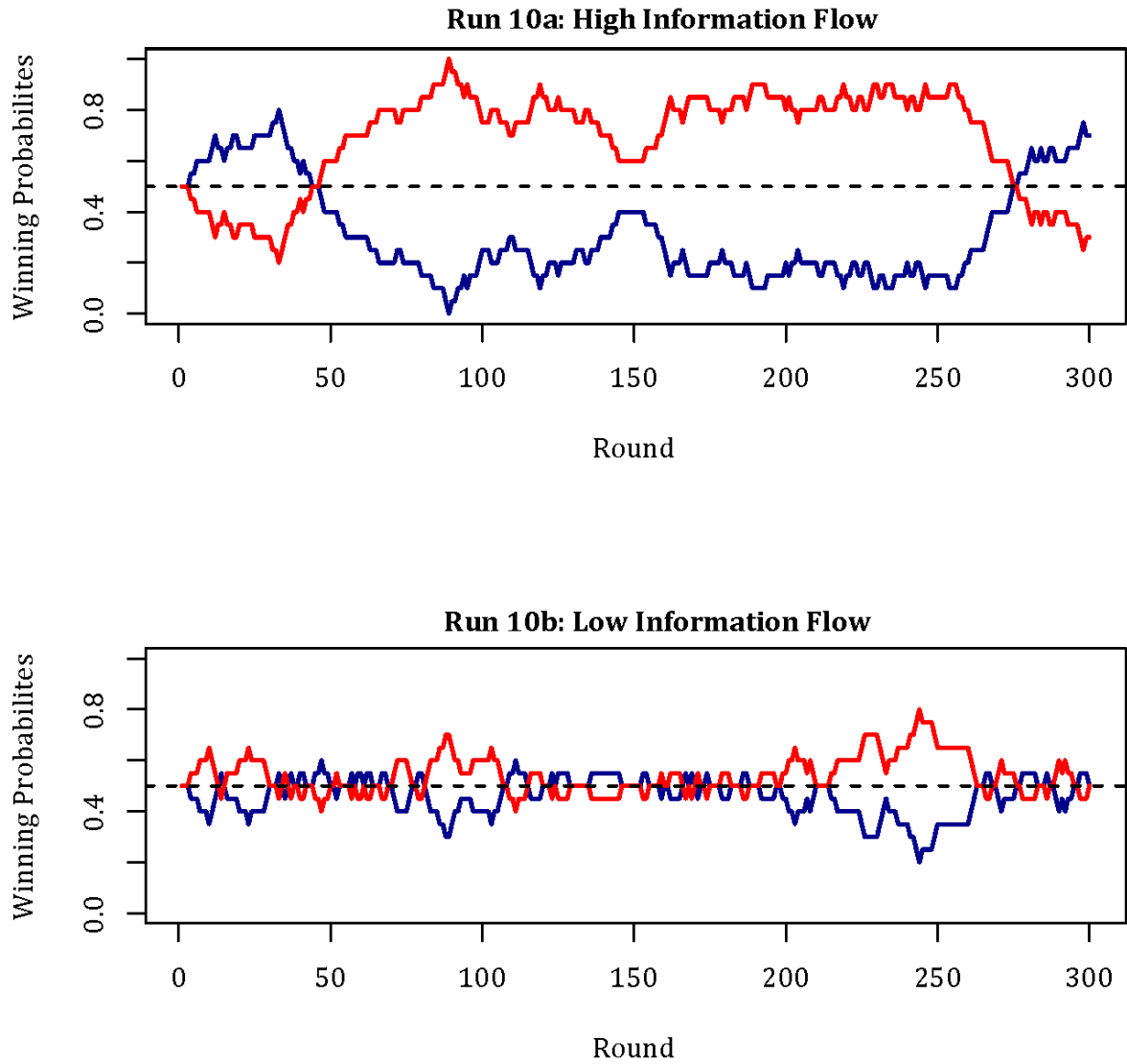
Run	Democrats Ratio	Republicans Ratio
9a: Republicans Dominate	0.1	0.9
9b: Equally Dominate	0.5	0.5
9c: Democrats Dominate	0.9	0.1

Variation in Information Flows

Regarding the frequency with which information arrives in the market, Figure 13 shows how varying rate of information arrival to the market affects the price fluctuations. We know that information leads to changes in expectations, which in turn lead to changes in prices. If the rate of information flow is 1 (Run 10a), traders will update new information all the time and incorporate it into prices. But this information overload may cause a negative impact on the trader's decision to buy or sell the contracts.¹⁹ Run 10a shows that the market prices are volatile and labile under the excessive information environment (SD=0.196). On the other hand, if the rate of information flow is 0.1 (Run 10b), traders' decisions will be primarily derived from prior beliefs due to absent new information. Similarly, Mondak (1993) argues that people are more likely to rely on heuristics when there is difficulty in obtaining information. Run 10b presents a small magnitude of price volatility relative to Run 10a (SD= 0.079). In particular, Run 10b allows us to understand 1) how voters make choices in the low-information local elections they commonly face, such as primaries, and 2) that the relative importance of prior beliefs would be greater when new information is scarce.

¹⁹Andersen (1996) argues that the volatility, or the variance of the prices, is primarily caused by the arrival of new information and the process that incorporates this information into market prices.

Figure 13: Varying Information Flow

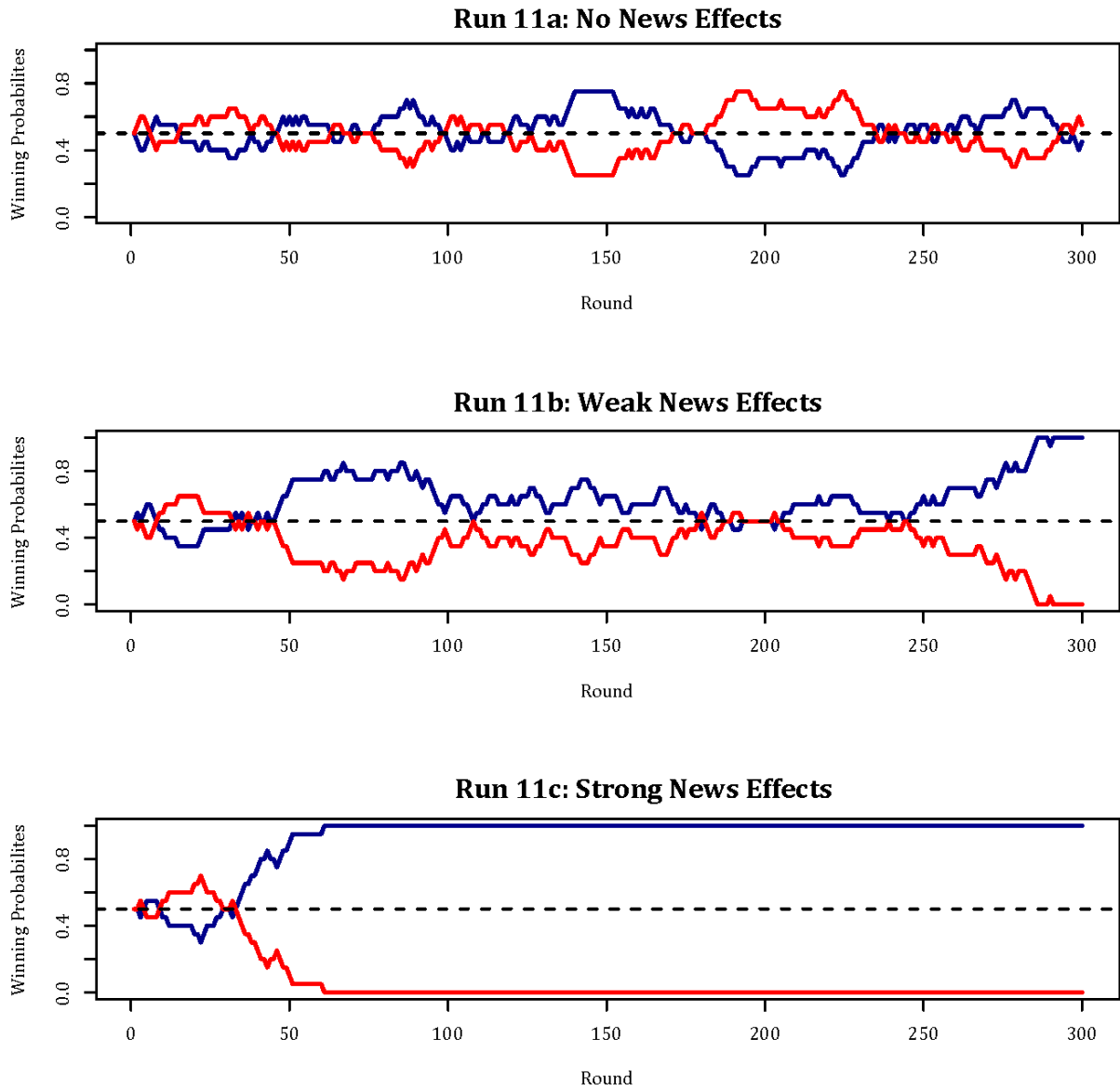


Run	Information Occurrence Rate
10a: High Information Flow	1
10b: Low Information Flow	0.1

Variation in News Effects

Figure 14 shows how strongly the market price fluctuates in response to news. For this, I simulate different levels of news effects ranging from 0 to 0.7. The results represent that the higher level of news effects leads to less fluctuating and more stationary patterns. In particular, Run 10c (Figure 14) shows that both prices turn constant after the initial fluctuations. One interpretation of the reduction in volatility is that the traders are coming to a stable judgment about the candidates' probable performance (Gelman and King, 1993). We know from prior research that pre-election polls are wildly variable but decline in variance as the election comes closer. This also implies that strong news effects may cancel out the partisan effects. In this case, the updated beliefs do not work at all to change the candidates' evaluations.

Figure 14: Varying News Effects



Run	News Effects
11a: No News Effects	0
11b: Weak News Effects	0.1
11c: Strong News Effects	0.7

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3 Part Two: Bounded Psychological Partisans:

How Political Knowledge and Monetary Incentives Moderate the Effect of Partisan Bias in Evaluations of Political Candidates

Party identification is a pervasive political predisposition and it affects factual beliefs about politics. For many voters, party identification functions as an informational shortcut, providing reasons to support their political judgment. Scholars have extensively scrutinized the impact of partisan predispositions and many of them agree that partisan attachments strongly affect not only voting behavior but also the formation of opinions on the issues (Campbell et al. 1960; Stokes 1966; Pomper 1972; Jacoby 1995; Zaller 1992).

Given different factual beliefs about politics, scholars of voting behavior have studied differences between partisan groups (Rahn 1993; Kuklinski et al. 2000; Taber and Lodge 2006; Iyengar et al. 2012; Jerit and Barabas 2012; Ansolabehere et al. 2013) since *The American Voter* (Campbell et al. 1960). They have found that Democrats and Republicans consistently diverge in their policy preferences (Cohen 2003; Lodge and Taber 2005), perceptions of objective economic indicators (Bartels 2002), evaluations of political candidates (Goren 2002; Lebo and Cassino 2007), and interpretations of politically-relevant factual information (Gaines et al. 2007).

While literature on partisan bias has enhanced understanding of how partisanship shapes information processing, public opinion, and voting behavior, however, it has largely overlooked the conditions under which partisan biases can be moderated. Although recent studies incorporate individual-level moderators such as political sophistication (Taber and

* *Acknowledgment*: Financial support for this project was provided by the Center for Political Behavioral Economy at Stony Brook University. The experiments presented here were approved by Stony Brook University Institutional Review Board (IRB). CORIHS# 2013-2418-R1.

Lodge 2006), strength of prior attitudes (Taber, Cann, and Kucsova 2009), and partisan ambivalence (Lavine, Johnston, and Steenbergen 2012), they have paid less attention to the way in which contexts condition partisan bias. Thus, this leads us to the key question of how partisan bias influences information processing and when those biases can be moderated.

Building on theories of partisan bias and biased information processing, first I examine how partisan biases shape information processing in assessments of political candidates. Based on the laboratory experiment, this study captures the effect of partisan biases in information processing by observing how partisans' evaluations of political candidates diverge from non-partisans when they are presented with the same information.¹ Further, I also investigate what conditions induce strong partisans to behave rationally at the individual level. In particular, this paper aims to explore how the perceptual gap between Democrats and Republicans can be diminished by focusing on individuals' monetary incentives and political knowledge.

The rest of the paper proceeds as follows. I begin by reviewing the nature of partisanship and information processing among partisans. Then I expand on the dynamic nature of partisanship and argue that the perceptual gap between different partisans can be diminished. In the following sections, I will explain my experimental design and results. The final section considers the implications of my results and avenues for future research.

¹Some scholars have argued that partisan responses to diagnostic information can serve as a baseline for understanding partisan information processing (Bartels 2002; Bullock 2009; Gerber and Green 1999; Tetlock 2005). Such research assumes that diagnostic information may mitigate the influence of partisanship. However, testing this assumption is difficult with existing observational data. Besides, respondents' reported judgment within the survey context continues to reflect their affinity to tow the party line since the incentive to report a true perception within the survey context is low. Further, the survey situation may provide little cost for a respondent to revise their original political judgment even in the face of contrary information (Ramirez and Erickson 2014).

Partisanship and Perceptual Bias

In the political science literature, there are three dominant approaches to the study of partisanship. First, the Michigan School proposes that the root of partisanship lies in a psychological attachment to a political party (Campbell et al. 1960; Converse 1969). When strong enough, such a psychological attachment may become part of a person's identity. Campbell et al. (1960) argue that partisanship is stable not because it acts as a reliable representation of political beliefs, but because it shapes political beliefs itself.

On the other hand, revisionists attempt to place the study of partisanship on a more rational basis. They argue that partisanship - both at the individual and aggregate levels - may not be as stable as the Michigan School models have argued. This perspective suggests that partisanship is a "running tally" of one's overall feelings about different political parties (Fiorina 1981) rather than the result of individual psychological mechanisms. In this case, partisanship may be constantly updated with new perceptions of the parties' policy positions and competence (Franklin and Jackson 1983; Achen 1992, 2002).

A recent addition to this debate has come from the perspective of social identity theory (Green, Palmquist, and Schickler 2004; Greene 1999; Huddy, Mason, and Aare 2010; Iyengar, Sood, and Lelkes 2012). According to this perspective, the Michigan School has mistakenly fixed the target of partisanship at the party itself and revisionists have overstated the degree of instability in individual and aggregate levels of partisanship. Criticizing both perspectives, the social identity approach argues that partisanship is a function of realizing that one shares an identity with supporters of a particular party. In particular, individuals categorize themselves and others who share relevant attributes as in-group members. Thus, people in the same political group are often favored and viewed positively, while those in the out-group are disfavored and perceived negatively (Huddy 2001; Tajfel 1982).

To account for partisans' different perceptions, the literature on public opinion and political psychology suggests that partisans may have different perceptions in processing

political information and updating their opinions at the individual level (Berelson et al 1954; Campbell et al. 1960; Finkel 1993; Goren 2002, 2007; Jacoby 1988; Markus and Converse 1979; Stokes 1966; Zaller 1992; Gaines et al. 2007; Kunda 1990; Taber and Lodge 2006; Taber et al. 2009). A classic explanation for perceptual bias in the voting literature (Campbell et al. 1960) posits that partisanship raises a “perceptual screen.” Party loyalties powerfully shape individuals’ perceptions and partisans selectively perceive the political environment (Berelson et al 1954; Campbell et al 1960; Bartels 2002; Jacoby 1988). Recently, Bartels (2002) has also argued that partisans respond to political information in potentially biased ways. He shows that partisan bias still remains influential even when considering individuals’ prior beliefs and measurement error. Although Bartels mentions partisan bias, however, he does not provide any evidence that partisan bias may be explained by individuals’ biased information processing.

Although a political party often guides individuals to informed political decisions, it may also motivate individuals to view politics in ways that are favorable to their party and unfavorable to the opposition party (Bolsen et al. 2014; Groenendyk 2013; Slothuus and de Vreese 2010; Taber and Lodge 2006). For example, Taber and Lodge (2006) claim that “all reasoning is motivated” (756). When individuals rely on motivated reasoning, they seek out political information that is consistent with their prior beliefs but they often discount or sometimes ignore information that is inconsistent with their predispositions. However, Taber and Lodge’s experiment focuses on individuals’ perceptions about particular policies rather than their perceptions of candidate or party positions, thereby leaving open the question of whether the latter may also be affected by motivated political reasoning. Nyhan and Reifler (2010) also show that partisans tend to ignore corrective information that counters their ideological views. Similarly, Jerit and Barabas (2012) find that partisans selectively learn party-relevant factual information. Likewise, in line with this reasoning, many observational studies suggest that motivated reasoning leads partisan groups to interpret the same information in different ways, through their partisan

biases about factual information (Bartels 2002; Shani 2006; Gaines et al. 2007; Blais et al. 2010).

In contrast, Gerber and Green (1998, 1999) argue that individuals are rational and unbiased in information processing. Given that individuals may interpret and process information in the same way, then differences in perceptions among different partisans may occur due to the different information that they encounter. In addition, partisans might have more accurate information about their own party than the opposing party. Thus, the Bayesian learning perspective suggests that there will be fewer differences in political perceptions between different partisans with high levels of information. This means that more political information increases the amount of information that different partisans have in common. The more their sets of information overlap, the closer their perceptions should be.²

Recently, some researchers have begun to claim that offering monetary incentives may induce partisans toward rational behavior (Prior 2007; Prior and Lupia 2008; Khanna and Sood 2016; Prior, Sood and Gaurav 2015; Bullock, Gerber, Hill and Huber 2015; Hill 2016). For example, in a review of experiments involving monetary incentives, Morton and Williams (2010, Chapter 10) argue that incentives often reduce the size and frequency of decision-making errors. Prior (2007), Prior and Lupia (2008), and Prior et al. (2015) also examine the effects of monetary incentives on individuals' responses to factual questions. Even if scholars have found mixed results for the effect of monetary incentives, they agree that monetary incentives may reduce party differences in responses to factual questions. Bullock et al. (2015) also show that even small incentives reduce partisan divergence substantially. However, their study does not show how monetary incentives and a peer group may affect motivated reasoning in political information processing. The following sections argue that monetary incentives as well as political information either moderate or

²However, Kim, Taber, and Lodge (2010) directly compare computational models built on motivated reasoning and Bayesian learning, and find that motivated reasoning provides a more consistent rationale for the persistence and polarization of attitudes.

increase partisanship's influence when individuals evaluate political candidates.

Diminished Perceptual Gap between Different Partisans

Partisanship not only shapes political attitudes and perceptions, but also influences how individuals search for and interpret political information. The main understanding for why partisan bias emerges is based on the theory of partisan motivated reasoning. It simply suggests that political information consistent with individuals' partisanship is more likely to be trusted. In the context of American Politics, American public opinion shows large differences between Democrats and Republicans in their attitudes toward factual information. For example, regarding the presence of Iraq's WMDs, a survey conducted by YouGov³ from April 26 to May 2, 2012 shows that 62.9% of Republicans thought there were WMDs in Iraq when the United States invaded in 2003. By contrast, 63.1% of Democrats correctly recalled that there were no WMDs found in Iraq. Similarly, according to Ladd (2010), when Democratic leaders criticize the media, liberal Democrats evaluate the media more negatively but conservative Republicans are unmoved; the reverse occurs when Republican leaders criticize the media. Likewise, such a partisan divide appears in many surveys on various topics.⁴

Similarly, partisans are motivated to seek out and evaluate information in ways consistent with their partisan identities, which may include ignoring, discounting or misperceiving information that would challenge their prior beliefs (Bartels 2002; Druckman, Peterson and Slothuus 2013; Iyengar, Sood and Lelkes 2012; Iyengar and Westwood 2014;

³<http://www.dartmouth.edu/~benv/files/poll%20responses%20by%20party%20ID.pdf>

⁴In 1988, when ANES asked respondents whether "compared to 1980, the level of unemployment in the country ha[d] gotten better, stayed about the same, or gotten worse?" over 80 percent of strong Republicans and nearly 70 percent of weak Republicans correctly reported that unemployment had declined. In contrast, only about 30 percent of strong Democrats correctly reported it (Bartels 2002). In 1996, when ANES asked about changes during President Clinton's first term, more Republicans than Democrats failed to acknowledge positive changes in some economic indicators (Achen and Bartels 2006). In 2010, Harris Interactive surveyed adults to ask about whether Barack Obama was born in the United States; 45 percent of Republicans stated that he was born abroad, compared to only 8 percent of Democrats (Harris Interactive 2010). Similar patterns describe reported beliefs about health care (Nyhan 2010), foreign policy (Jacobson 2010), and social services (Jerit and Barabas 2012), among other issues.

Jacobson 2010). Smirnov et al.(2010) also point out that the behavior of partisans is different from non-partisans. They show that partisans act as strong reciprocators contributing to public goods and punishing non-contributors at higher rates than non-partisans. Thus, given different information processing mechanisms between partisans and non-partisans, partisans may discount discomfoting information through various processes of motivated reasoning if this information conflicts with their prior beliefs or group identity.

Hypothesis 1: *Partisans evaluate information in a manner consistent with their partisanship.*

In the U.S., Democrats and Republicans vary in their perceptions of reality or accuracy about factual knowledge. However, individuals do not always interpret political information with partisan bias. Sometimes they may consider information in a more even-handed manner (Bullock 2009; Druckman 2012; MacKuen et al. 2010). Scholars have pointed out that political knowledge helps citizens sort through political facts and to resist biased information (Stroud 2011, 95). Thus, one might expect that attentive citizens with higher levels of political knowledge can recognize signs of political bias and discount biased information.

Moreover, citizens cannot entirely avoid news sources that challenge their views. Political information may moderate the effect of partisan updating. Presumably, at some point, partisans might realize that their previous beliefs were simply wrong. In this case, partisan bias could be greater among politically knowledgeable citizens despite conventional wisdom (Zaller 1992; Bartels 2002, 2008; Shani 2006; Meffert et al. 2006; Taber and Lodge 2006). If partisans are less knowledgeable, the tipping point may occur rapidly. According to Lodge and Taber (2000, 211), knowledgeable partisans are the ones “who typically hold the strongest attitudes, with the most confidence, and who have the most facts at hand, thereby making them more able to assimilate supporting evidence and better equipped to discredit arguments that challenge their established beliefs or attitudes.” This suggests that a higher level of political knowledge does not help partisans mitigate their

biases. Further, partisans with a higher level of political knowledge and stronger political leanings tend to seek out more likeminded information.

Hypothesis 2: *Politically knowledgeable partisans are more resistant to new information and rely more on their partisanship for their vote choice.*

In addition to political knowledge, monetary incentives frequently are suggested as a method for motivating and improving the performance of individuals in judging political information (Atkinson, Banker, Kaplan, Young 2001; Horngren, Foster, and Datar 2000; Zimmerman, 2000). Prior and Lupia (2008) study the effect of financial incentives on responses to factual questions about politics. While Prior and Lupia (2008) do not study the effects of monetary incentives on partisan patterns, Prior (2007) and Prior et al. (2015) have examined the effects of incentives on partisan response patterns to factual questions about politics. Recently, Bullock et al. (2015) have argued that small financial inducements for correct responses may reduce partisan divergence and that these reductions become ever larger when financial incentives are provided for “don’t know” answers. Both partisan bias and political ignorance are greatly reduced if respondents are given financial rewards for correct answers.

Given that monetary incentives may reduce partisan bias in evaluating political information, political information would lead both Republican and Democrats’ beliefs to converge as the Bayesian updating model suggests. Although Democrats and Republicans might differ in their evaluations at the initial stage, both groups would move in the same direction due to monetary incentives and political information. This implies that when monetary incentives are offered, political information helps partisans to do objective learning and rational updating. Thus, when monetary incentives are given, participants have motivation to assess new information in a less biased manner.

Beyond mere monetary incentives under the experimental context, monetary incentives include any potential policy benefits partisans are expected to receive in the real world. Thus, we need to think about how the policy benefits may affect partisans’ updating of

their identity. Many scholars have asserted that party identification is the product of more-or-less rational evaluations of a party's policy and performance (Achen 1989, 2002; Fiorina 1981; Franklin and Jackson 1983; Shively 1979). For example, Shively (1979) once argued that party identification is instrumental to attaining policy benefits. According to this perspective, individuals may evaluate differences in policy and performance benefits among competing parties and update their partisan identity to demonstrate their pragmatism. When a party does not serve partisans' interests, those partisans are more likely to vote for the opposite party's candidate.

Hypothesis 3: *When partisan voting conflicts with individuals' interests, monetary incentives reduce partisans' propensity to choose their favored candidate over the opposite party's candidate.*

Experimental Design

To examine my hypotheses, I conducted laboratory experiments to ask about subjects' vote choices under various conditions. Laboratory experiments not only provide the most direct way to test the logic of partisan bias, but also give me an enormous amount of control over the scenario presented to respondents. Thus, my experiment allows me to isolate the specific causal factors that shape the degree to which citizens actually impose partisan biases on candidates.

All experiments include two hypothetical Democratic and Republican candidates running for election. Subjects participating in these experiments were 290 undergraduate students at Stony Brook University; 52% of the participants were female, and 41% were White. Democrats were somewhat overrepresented among the participants, with 66% self-identifying as Democrats, 16% as Republicans, and 18% as Independents. Participants were more evenly divided in terms of political interest, with 19% indicating they were little interested in politics, 42% moderately interested, and 39% highly interested.⁵

⁵See Appendix.

To examine how monetary incentives may moderate partisan bias, I conducted the same experiments in two conditions: No Monetary Incentives (control group) and Monetary Incentives (treatment group). While subjects in the control group (n=133) received extra credit for political science courses⁶, subjects in the treatment group (n=157) were recruited through the Department of Political Science research sign-up system. I conducted 7 sessions of these computerized experiments, with 21 to 27 subjects participating in each session.⁷ In the treatment group, a subject received either a cash incentive or a cash penalty depending on whether the hypothetical candidate the subject selected won the election. Thus, if a subject is rational, she should cast a vote for the candidate who has a higher winning probability regardless of a candidate's party. In the no monetary incentive condition (control group), on the other hand, a subject earned one extra credit point regardless of the election outcome. Other than the pay-off mechanism, all experimental procedures are the same in both conditions.

In this experiment, an electoral outcome is determined by the majority rule by all participants and the voters' payoffs depend on which of the two candidates wins the election. In each experiment, before deciding her vote choice, the subject received political information, such as the candidates' ideological positions, election forecasts, personal criticism of each candidate, news media's endorsements, news interviews, commentators' analyses of the first debate, and polling results.⁸ This political information not only provides attentive subjects with some diagnostic information, but also makes even the least-informed subjects guess which candidate is more likely to get more votes. However, given that each subject's interpretation of political information differs, each piece of information may induce uncertainty, biases, or strategic calculation when a subject makes her vote decision.

⁶The following courses' students participated in this non-paid experiment in the 2014 Fall semester: POL: 102.2 Intro to American Government, POL 201: Intro Stat Methods, POL 325: Civil Rights and Civil Liberties, POL 324: Political Parties and Pressure Groups.

⁷As the experiment follows the majority rule, the number of subjects should be odd.

⁸See Appendix

Each subject in the treatment condition was paid a show-up fee of \$5 and offered an additional opportunity to earn more money based on the decisions she and other subjects made in the same experiment. The experiment was repeated for ten rounds.⁹ The experimental program was written using z-Tree (Fischbacher 2007) and Qualtrics. The range of total payoffs was between \$5 and \$15, and a session lasted about 60 minutes. This monetary incentive study is based on cost-conscious individuals who make political choices based on subjects-group effects¹⁰ and the information offered in each round. If subjects succeed (fail) in predicting the winning candidate in a round, they gain (lose) \$1. At the end of the experiment, the subjects were paid (in cash) the show-up fee plus their total earnings during the experiment.

Experimental Results

First, I report simple cross tabulations for the relevant values of interest. Table 1 shows three values: (1) the percentages of partisans who voted for the Democratic candidate in the monetary incentive study (treatment); (2) the percentages of partisans who voted for the Democratic candidate in the no monetary incentive study (control); and (3) the difference between the two percentages.

Given that the vote choice is the same in all cases (vote for a Democratic candidate), I compare the “Monetary Incentives” condition with the “No Monetary Incentives” condition, allowing me to isolate the “monetary incentives” effect in moderating partisan biases. First, Table 1 shows that for Democrats, there is the 10-percentage point decrease in voting for a Democratic candidate in the treatment group. On the other hand, Republicans

⁹ Experimental sessions included 157 subjects who participated in sessions that involved 10 rounds, for a total of 1,570 subject-rounds. Analyses are pooled with a clustering correction for multiple observations on the same subjects (Rogers 1993). Details regarding the recruitment of subjects can be found in the Appendix.

¹⁰The psychological theories predict how the demographic composition of one’s neighborhood affects voters’ political behavior. For example, frequent exposure to opposing views makes voters ambivalent and uncertain of their own positions, and as a result they become less expressive (Feldman and Zaller 1992; Zaller 1992; Hochschild 1993; Green et al. 2000). In this experiment, as the majority’s decision is directly related to the subjects’ earnings, subjects may be sensitive to others’ partisanship or attitudes.

have more incentives to vote for the Democratic candidate (35-7=28%) when monetary incentives are offered. However, there is no significant difference between treatment and control groups when subjects are non-partisans. Figure 1 illustrates that monetary incentives may moderate individuals' partisan biases. It implies that the perceptual gap between Democrats and Republicans is diminished when monetary incentives are given.

Table 1: Voting Behaviors and Monetary Incentives
 (a) Voting Behaviors of Partisans under Monetary Incentives
 (Vote Choice=Democratic candidate)

Control Group	Treatment Group	Difference
No Money & Democrats 76% [74, 79] (N=910)	Money & Democrats 66% [63, 69] (N=1000)	10% [6, 14]
No Money & Republicans 7% [4, 10] (N=240)	Money & Republicans 35% [29, 41] (N=240)	-28% [-34, -21]

*Note: 95% confidence intervals in brackets.

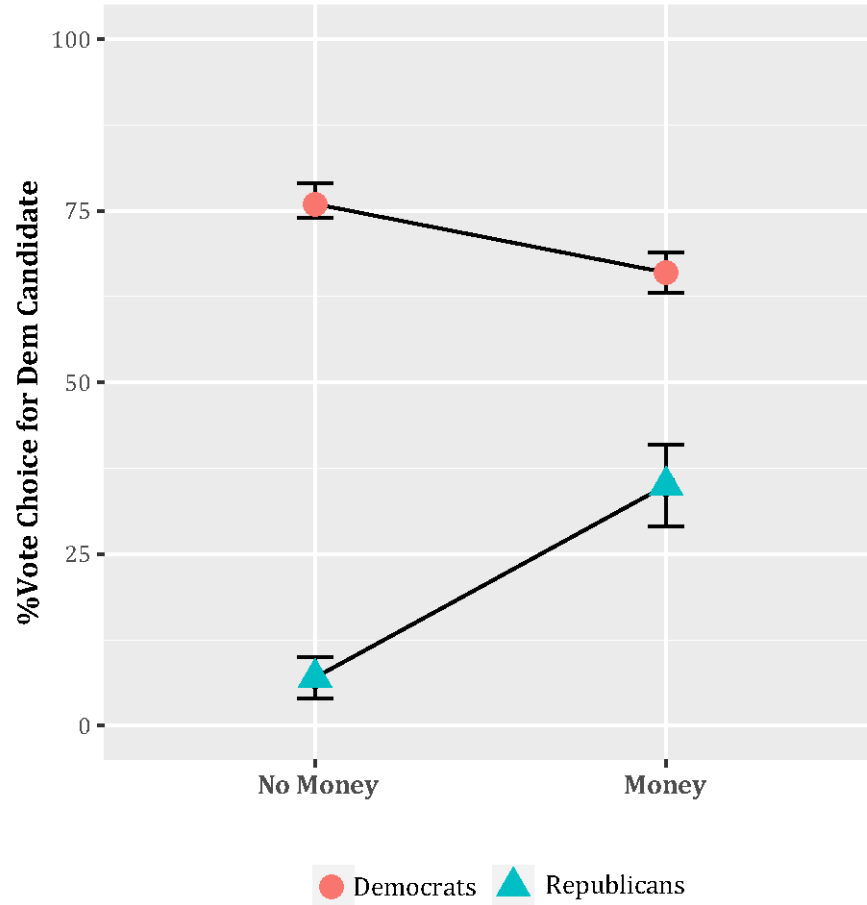
(b) Voting Behaviors of Non-Partisans under Monetary Incentives
 (Vote Choice=Democratic candidate)

Control Group	Treatment Group	Difference
No Money & Non-partisans 46% [39, 53] (N=180)	Money & Non-partisans 51% [46, 57] (N=330)	-5% [-14, 4]

*Note: 95% confidence intervals in brackets.

On the other hand, when I compare the vote choice between the most knowledgeable and least knowledgeable subjects, Tables 2 (a) and (c) show that Democrats with high political knowledge are more likely to vote for a Democratic candidate despite different types of political information. These results suggest that more knowledgeable Democrats are more likely to resist political information that challenges their established beliefs. However, I did not find a similar effect among Republicans. When monetary rewards are given,

Figure 1: Monetary Incentives and Diminished Perceptual Gap



on the other hand, there is no significant difference between more knowledgeable and less knowledgeable partisans as Table 2 (b) shows.

The next step of my analysis is to examine when individuals vote for a different party rather than for the one they identify with. Table 3 presents the effect of the monetary incentives, party identification, and political knowledge on non-partisan voting. First, I examine the quadratic relationship between Party ID and non-partisan voting. While the Party ID variable is positive, the Party ID-squared variable is negative as expected in all Models 1 to 4. This means that strong partisans are less likely to vote for a different party's candidate.

Interestingly, compared to the control group (No Monetary Incentive), monetary in-

Table 2: Voting Behaviors and Political Knowledge

(a) No Monetary Incentives (High Political Knowledge vs. Low Political Knowledge)

Control Group	Treatment Group	Difference
Democrats & Low Political Knowledge 72% [68, 76] (N=530)	Democrats & High Political Knowledge 82% [78, 86] (N=380)	Vote Choice=Democratic Candidate -10% [-15, -5]
Republicans & Low Political Knowledge 92% [88, 97] (N=130)	Republicans & High Political Knowledge 94% [89,98] (N=110)	Vote Choice=Republican Candidate -2% [-8, 5]

**Note: 95% confidence intervals in brackets.*

(b) Monetary Incentives (High Political Knowledge vs. Low Political Knowledge)

Control Group	Treatment Group	Difference
Democrats & Low Political Knowledge 65% [62, 69] (N=590)	Democrats & High Political Knowledge 67% [63, 72] (N=410)	Vote Choice=Democratic Candidate -2% [-8, 4]
Republicans & Low Political Knowledge 65% [57, 74] (N=110)	Republicans & High Political Knowledge 65% [57,74] (N=130)	Vote Choice=Republican Candidate 0% [-12, 12]

**Note: 95% confidence intervals in brackets.*

(c) No Monetary Incentives + Monetary Incentives (High Political Knowledge vs. Low Political Knowledge)

Control Group	Treatment Group	Difference
Democrats & Low Political Knowledge 69% [66, 71] (N=1120)	Democrats & High Political Knowledge 74% [71, 77] (N=790)	Vote Choice=Democratic Candidate -5% [-10, -2]
Republicans & Low Political Knowledge 80% [75, 85] (N=240)	Republicans & High Political Knowledge 78% [73,84] (N=240)	Vote Choice=Republican Candidate 2% [-6, 9]

**Note: 95% confidence intervals in brackets.*

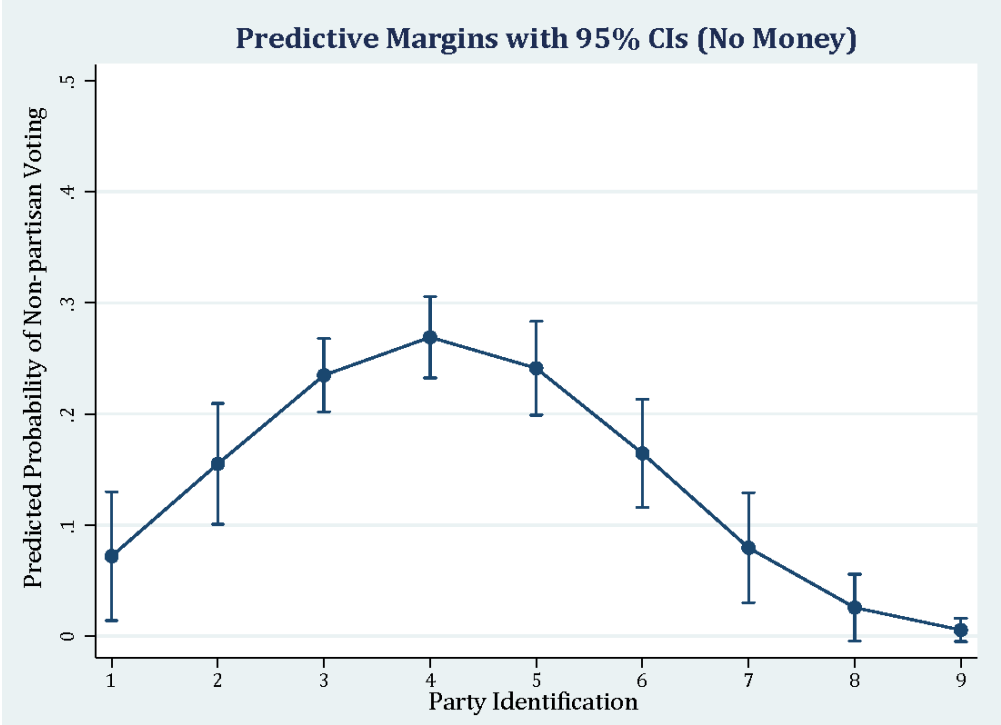
centives lead even strong partisans to vote for the other party’s candidate. Figure 2 shows the differences between the control and treatment groups in the predicted probabilities of individuals’ non-partisan voting. Even if both groups show the similar quadratic relationship between party identification and non-partisan voting, the predicted probability of non-partisan voting drops off sharply when individuals are strong Democrats or Republicans in the control group (No Monetary Incentive). On the other hand, we can observe a smoother curve in the treatment group (Monetary Incentive). Given a series of political information, Figure 2 also suggests that monetary incentives may diminish the perceptual gap between Democrats and Republicans.

Table 3: Regression Models for Non-Partisan Voting

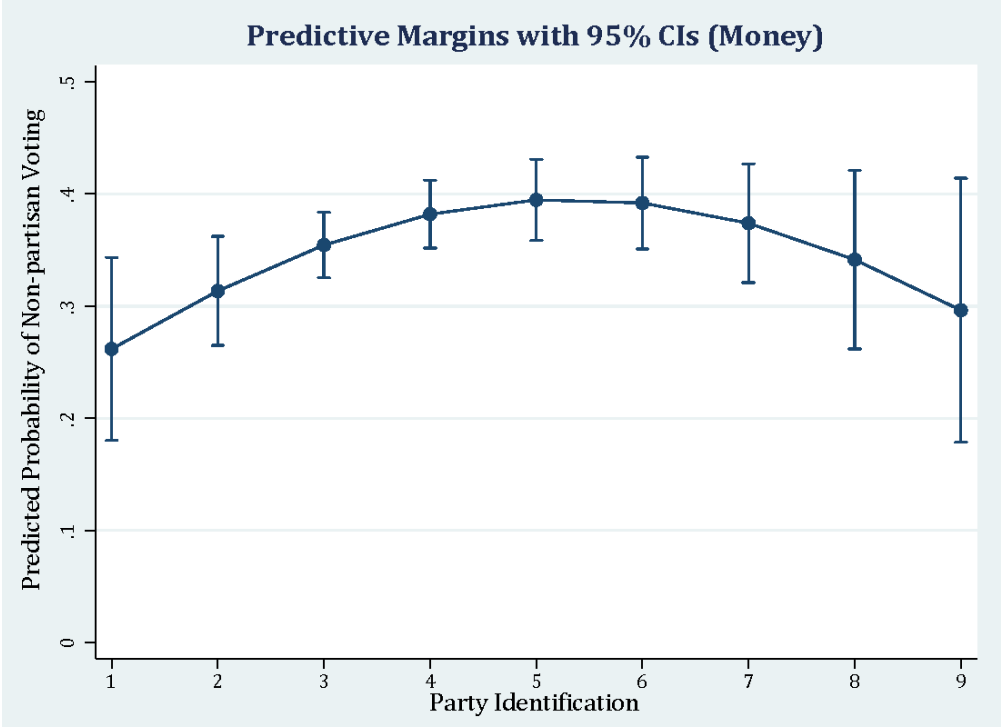
DV: Non-Partisan Voting _t	Model 1 (No Money)	Model 2 (Money)	Model 3 (Money)	Model 4 (Money)
Non-Partisan Voting _{t-1}	0.971*** (0.181)	2.313*** (0.149)	2.319*** (0.153)	1.303*** (0.183)
Party ID	1.423*** (0.367)	0.465** (0.202)	0.464** (0.202)	0.757*** (0.225)
Party ID ²	-0.176*** (0.367)	-0.044** (0.202)	-0.048** (0.202)	-0.084*** (0.225)
Total Earning			-0.100*** (0.023)	-0.131*** (0.032)
Earning _{t-1}				-0.648*** (0.127)
Non-Partisan Voting _{t-1} × Earning _{t-1}				2.186*** (0.188)
Political Knowledge	-0.076** (0.038)	-0.014 (0.034)	-0.025 (0.034)	-0.066* (0.036)
Political Interests	-0.084** (0.037)	0.048 (0.030)	0.048 (0.031)	0.039 (0.032)
Constant	-2.881*** (0.900)	-2.671*** (0.612)	-2.240*** (0.624)	-2.060** (0.671)
Number of Observation	1035	1116	1116	1116
Log-likelihood	-483.211	-582.28	-574.33	-500.72
Pseudo R ²	0.11	0.20	0.22	0.32

*Note: The dependent variable is “Non-partisan voting” (Non-partisan Voting=1; Partisan Voting=0). Cells report logit estimates with standard errors clustered by subjects in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$ (Two-tailed test).

Figure 2: The Impact of Party ID on Non-Partisan Voting (No Money vs. Money)



(a) No Money Incentives



(b) Money Incentives

To capture the impact of the monetary incentives, I add two variables: the cumulative payoffs (Total Earning) and payoffs in the previous round ($Earning_{t-1}$) in Models 3 and 4. In Models 3 and 4, both variables have a negative impact on non-partisan voting. As long as subjects have received a lot of cumulative earnings, they have no incentives to vote for the other party's candidate. In other words, when subjects think they have not received enough reward from an experiment, they have incentives to switch their votes to the other party's candidate. In Model 4, I also include an interaction term between the previous round's payoff ($Earning_{t-1}$) and non-partisan voting ($Non-Partisan\ Voting_{t-1}$). When subjects voted for the other party's candidate in the previous round, they are more likely to select that party's candidate in the current round. This effect is also stronger when they earned payoffs in the previous round.

In addition, political knowledge is negatively associated with the likelihood of non-partisan voting in Models 1 and 4. When subjects have higher levels of political knowledge, they are more likely to vote for the party they identify with. This implies that higher levels of political knowledge may not mitigate individuals' partisan biases.

Lastly, I examine the impact of party identification, monetary incentives, and political knowledge on vote change in Table 4. Given that the dependent variable is whether a subject's current vote choice is different from the previous round's choice ($Vote\ Change=1$, $No\ Vote\ Change=0$), extreme partisans are less likely to switch their vote in Models 5 and 6. In Model 6, when subjects' total earnings are small or subjects did not receive financial rewards, they are more likely to change their votes in the present round. Political knowledge is negatively significant only in Model 6. This result partially supports that politically knowledgeable persons hold the stronger attitudes. Lastly, the number of rounds has a negative coefficient in both Models 5 and 6. As subjects participate in more experiments, they tend to stick to their original vote decision. Subjects are more likely to switch their votes during the initial rounds of the experiments.

Table 4: Regression Models for Vote Change

DV: Vote Change	Model 5 (No Money)	Model 6 (Money)
Party ID	1.146*** (0.216)	0.527** (0.213)
Party ID ²	-0.138*** (0.025)	-0.061** (0.023)
Total Earning _{t-1}		-0.125*** (0.035)
Earning _{t-1}		-0.728*** (0.098)
Political Knowledge	-0.026 (0.025)	-0.080** (0.032)
Rounds	-0.145*** (0.022)	-0.166*** (0.034)
Constant	-1.820*** (0.552)	-0.098 (0.585)
Number of Observation	1330	1413
Log-likelihood	-792.642	-621.09
Pseudo R^2	0.06	0.17

Note: The dependent variable is “Vote Change” (Vote Change=1; No Vote Change=0). Cells report logit estimates with standard errors clustered by subjects in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$ (Two-tailed test).

Conclusion

The primary goal of this study was to examine how partisans incorporate new political information into their evaluations of electoral candidates and when partisans’ perceptual biases can be moderated. Using the laboratory experiments, I find that strong partisans are less likely to vote for the opposite party’s candidate despite unfavorable political information about their party’s candidate, but monetary incentives may narrow the perceptual gap between Democrats and Republicans. In addition, when individuals receive unsatisfactory rewards or penalties due to voting results, they have more incentive to switch their votes to the other party’s candidate. Lastly, my experiment shows that partisans with higher levels of political knowledge are less likely to switch their votes. Given that politically knowledgeable persons hold the stronger attitudes or beliefs, they do not accept political

information that challenges their established beliefs or attitudes.

The results of this study have important implications for the study of partisanship as a “running tally” of rational calculations. My experimental results suggest that partisanship may be either enhanced or weakened through the lens of utility maximization as well as a partisan perceptual screen. While the Michigan School models have focused on partisans’ psychological attachments, revisionists argue that partisanship may be constantly updated with new perceptions of the parties’ policy positions and competence (Franklin and Jackson 1983; Achen 1992, 2002). My study also suggests that partisans’ perceptions may be heterogeneous depending on whether partisans receive the expected policy benefits.

Since all subjects are college students in my experiments, it might be hard to generalize my experimental results to other individuals with different occupations or education levels. Given that external validity does not hinge on the experiment mimicking a real-world scenario (Anderson and Bushman 1997; Berkowitz and Donnerstein 1982), however, my laboratory experiment has some degree of experimental realism. It engages similar causal processes as are engaged in the real world when partisans mitigate their perceptual biases. My findings here may also lay the foundation for other scholars interested in generalizing our partisan logic of voting behavior to other settings.

Appendix

Table 5: Descriptive Statistics

Variable	Mean	SD	Min	Max	N
<i>No Money</i>					
Male (Male=1, Female=0)	0.46	0.50	0	1	133
Age (1=18~20; 2=21~24; 3=25~29;4= + 29)	2.36	0.58	2	5	133
Hispanic (Hispanic=1, Non-Hispanic=0)	0.10	0.30	0	1	133
Race (1=White; 2=Black; 3=Asian; 4=Hispanic; 5=Other)	2.32	1.25	1	5	133
Party Identification (1=Strong Democrat ... 5=Independent ... 9=Strong Republican)	4.13	1.57	1	9	133
Ideology (1=Very Liberal ... 5= Moderate ... 9= Very Conservative)	3.80	1.64	1	9	133
Political Interest (0=Not Interested ... 10= Very Interested)	6.77	2.41	0	10	133
Political Knowledge	8.83	2.55	2	13	133
<i>Money</i>					
Male (Male=1, Female=0)	0.5	0.50	0	1	157
Age (1=18~20; 2=21~24; 3=25~29;4= + 29)	2.41	0.55	2	4	157
Hispanic (Hispanic=1, Non-Hispanic=0)	0.10	0.30	0	1	157
Race (1=White; 2=Black; 3=Asian; 4=Hispanic; 5=Other)	2.24	1.19	1	5	157
Party Identification (1=Strong Democrat ... 5=Independent ... 9=Strong Republican)	4.28	1.49	1	9	157
Ideology (1=Very Liberal ... 5= Moderate ... 9= Very Conservative)	3.86	1.49	1	8	157
Political Interest (0=Not Interested ... 10= Very Interested)	6.17	2.69	0	10	157
Political Knowledge	9.03	2.22	3	13	133

Question Wording

Demographic questions

Please read carefully and answer the following questions.

1. Your Name and Your Monitor Number

2. Gender

Male

Female

3. Would you please tell me how old you are?

Between 18 and 20

Between 21 and 24

Between 25 and 29

Over 29

4. To ensure that we have a representative sample, would you please tell me whether you are from a Hispanic or Spanish-speaking background?

Yes, Hispanic

No, not Hispanic

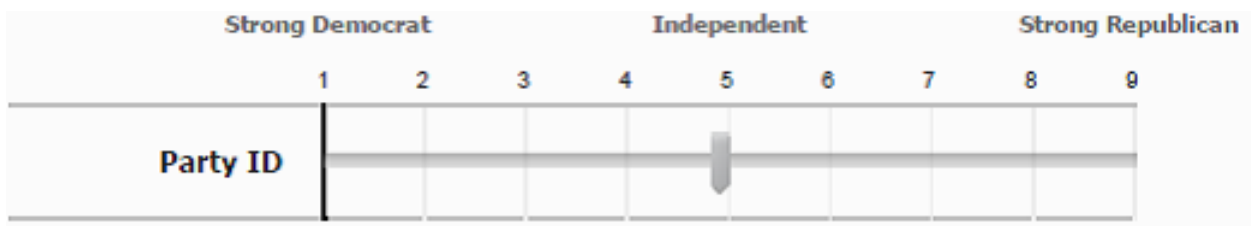
Not sure/refused

5. And again, for statistical purposes only, what is your race—white, black, Asian, or something else?

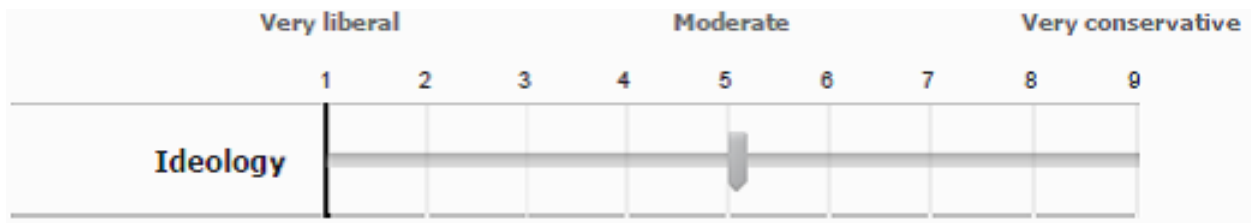
White

- Black
- Asian
- Hispanic
- Other (Specify)

6. Generally speaking, do you usually consider yourself a Republican, a Democrat, or an Independent? Please use a scale from one to nine, on which a 'nine' means that you are a Strong Republican and a 'one' means that you are a Strong Democrat. If you choose 'five', it means that you are Independent.



7. Where are your political views located? Please use a scale from one to nine, on which a 'nine' means that you are very Conservative and a 'one' means that you are very Liberal. If you choose 'five', it means that you are Moderate.



8. Please tell me how interested you are in the next presidential election, using a scale from zero to ten, on which a 'ten' means that you are very interested in the next election and a 'zero' means that you are not at all interested. You may choose any number.

Not at all interested										Very interested	
0	1	2	3	4	5	6	7	8	9	10	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

Political Knowledge Questions

The pre-test will be started. On the next screen, you will be presented with your questions.

In this pre-test, I'd like you to tell me your political knowledge.

Please do not use the back button in your browser during this survey. Any questions your answer a second time by using the back button will not be recorded. When you are ready, please click NEXT.

1. How many times can an individual be elected President of the United States?

1

2

3

4

2. How long is a U.S. Senator's term?

8 years

6 years

4 years

2 years

3. Do you happen to know how much of a majority is required for the United States Senate and House to override a Presidential veto?

A majority (fifty percent plus one vote)

Two-thirds (sixty-seven percent)

Three-fourths (seventy-five percent)

Ninety percent

Don't know

4. How many Justices are on the Supreme Court?

5

7

9

15

5. How many United States senators represent each state?

1

2

3

4

6. Which political party uses the donkey as its mascot or symbol?

Democratic Party

Republican Party

7. Overall, which party is considered to be the more conservative party on most political issues?

Democratic Party

Republican Party

8. The initials “G-O-P” are usually associated with [].

Democratic Party

Republican Party

9. What word is used for a long speech by a Senator that halts the passage of a bill? (One Word) If you don't know, type “DK”.

10. What kind of policy is the U.S. Federal Reserve primarily responsible for?

Energy Policy

Monetary Policy

Tax Policy

Trade Policy

11. Name current U.S. Secretary of State. If you don't know, type “DK”

12. Name current Vice President. If you don't know, type “DK”

13. Which party has U.S. House majority now?

Democratic Party

Republican Party

Prediction Market Game Instructions

Instruction

Our first part of the experiment is done. Thank you!

Now, we will start a decision making game.

Let me explain the background again.

This is a hypothetical situation.

The 2016 Presidential election is around the corner.

You are a pivotal voter. Here are two candidates: Democratic Presidential candidate A and Republican Presidential candidate B.

In each round, you will receive new information related to each candidate and then you need to make a decision about who you vote for.

Your decision may be made based on provided information or you may ignore it.

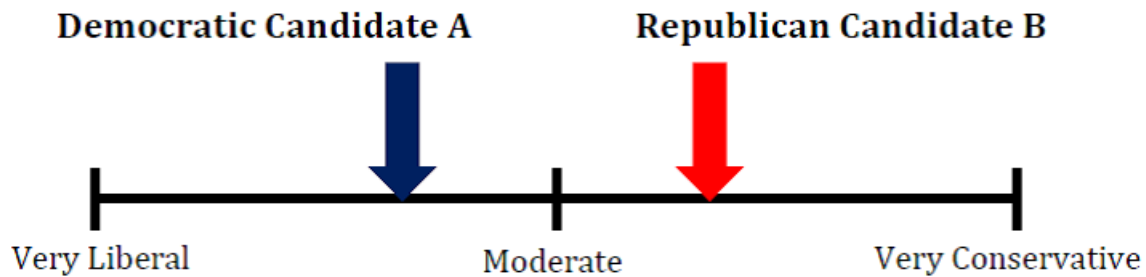
Please keep in mind that information is not always correct, which distracts you.

When you make a decision, you cannot communicate with anyone.

If you are ready, please click “Submit to complete” and wait until everyone is done.

Round 1

Please carefully take a look at the below graph. This graph indicates ideological positions for Democratic Candidate A and Republican Candidate B. Who do you vote for?



Round 2

After the presidential candidates had effectively been selected, but prior to the national party conventions and the presidential campaign, a Democratic victory did not appear so inevitable. According to NPR's political analysis, a number of developments during the presidential nominating contests gave Republicans hope for victory:

First of all, the Republican Party nominated Senator B (Republican candidate), who was widely seen as a maverick who disagreed with his own party on some important issues, which made him appealing to many Independent voters. Of all the contenders for the Republican nomination, B (Republican candidate) undoubtedly was the one who had the best chance of victory.

Second, the Democratic nomination contest proved to be a long and highly competitive battle. While Democratic candidate A prevailed, he did so only after what many regarded as a very divisive fight. A substantial number of Obama supporters, especially women, seemed unhappy with the outcome and reluctant to fully support Democratic

candidate A. Moreover, he had criticized the Obama administration on some high profile issues, which led some analysts to think that he could separate himself from the failures of the Obama presidency.

Moreover, Democratic candidate A had potential vulnerabilities. He was a very inexperienced presidential candidate, having served only four years in the U.S. Senate, and Republicans hoped to use that inexperience against him, especially when compared with the lengthy record of public service that Republican candidate B possessed. Also, there was speculation that some segments of the Democratic coalition, such as urban white working-class voters, would be reluctant to vote for a Southern presidential candidate.

Who do you vote for?

Round 3

At the Democratic National Convention, Democratic presidential candidate A directed a sharp assault on the foreign policy credentials of the Republican presidential candidate B. The Democratic platform has tried to connect the Republican candidate B and what it has characterized as a trigger-happy willingness to go to war, a critique that could be damaging if it manages to stick, since Americans have grown war-weary after a decade of combat.

The Republican candidate B fired back. At the Republican National Convention, the Republican candidate B criticized that the Democratic candidate A's foreign policy is confused, ineffective and has weakened U.S. influence in every region of the world. In particular, the Republican candidate B accused the Democratic candidate A of an absence of strong leadership in the Middle East.

Who do you vote for?

Round 4

Yesterday, the Washington Post endorsed a Democratic Presidential Candidate A for president of the United States, and expressed the hope that his victory would be accompanied by a new Congress willing to work for policies that Americans need. According to the WP editorial board, a Democratic Presidential Candidate A has shown a firm commitment to using government to help foster growth. Further, he has formed sensible budget policies that are not dedicated to protecting the powerful, and has worked to save the social safety net to protect the powerless.

On the same day, the Wall Street Journal also gave its endorsement to a Republican Presidential Candidate B. The WSJ editorial board says that a Republican Presidential Candidate B is an agent of change whose primary campaign thrust has been the economy and his plans and qualifications to improve it. The editorial board also pointed out that a Republican Presidential Candidate B better understands how and why entrepreneurs and employers decide to expand and add jobs. The board believes the best chance to get America back working again is to elect a Republican Presidential Candidate B.

Who do you vote for?

Round 5

Please read side-by-side comparisons of what the Democratic and Republican presidential hopefuls have said on the issues on voters' minds:

[Economy]

The economic situation has compelled the presidential candidates of both parties to hone their economic positions and provide their own ideas about how to avoid a recession.

[Iraq]

The Democratic candidate A says he wants to bring the troops home. But he also wants

to keep some U.S. troops in Iraq to go after the Islamic militants, protect diplomats and aid workers. He is vague as to how long those troops would stay. And the Republican candidate B talks about success and victory in the region, but with little detail.

[Immigration]

Immigration provides one of the clearest contrasts between the parties. Republican Candidate B has highlighted his get-tough approach, while Democrat Candidate A has generally avoided the topic unless asked.

Who do you vote for?

Round 6

[The Huffington Post Review about First Presidential Debate]

From the start, both candidates were a contrast in styles. Republican Candidate B was energetic, engaging, in command of the facts, and ready to pounce on Democratic Candidate A. The Democratic Candidate A, on the other hand, was often listless, his answers more a meandering stroll than the straight lines that Republican Candidate B was drawing.

The Republican Candidate B launched into his five-point plan for reviving the economy, touching on energy, trade, education, balancing the budget and promoting small business. He ended by characterizing Democratic Candidate A's approach as "trickle-down government," which he described as "bigger government, spending more, taxing more, regulating more." He said that the wealthy will "do fine whether you're president or I am." "The people who are having the hard time right now are middle-income Americans. Under the president's policies middle-income Americans have been buried."

On the other hand, during a conversation about how to reform the tax code in a way that increases economic growth and does not increase the deficit, the Democratic Candidate A hit Republican Candidate B as a champion for tax breaks for oil and gas companies. He said "I have identified areas where we can, right away, make a change that I believe

would actually help the economy,”

After Republican Candidate B’s strong performance on the First debate night, the Democratic Candidate A’s top adviser said “It wouldn’t shock me if he got some kind of bounce.” “Do I think it’s changed the basic dynamics of the race? Absolutely not.” “If they think they did so well,” he said, “then you show me, by next week, that Ohio’s tied, and Iowa’s tied, and Nevada’s tied, if not taken the lead.”

Who do you vote for?

Round 7

The FOX news raised a suspicion that the Democratic candidate A might be involved in the alleged banking and real estate scandals. But Democratic candidate A strongly denied that involvement. Further, according to the FOX news, a Democratic candidate A’s weak, indecisive leadership will be vacillated in dealing with events in Iraq, Israel, and Afghanistan. They point out that a Democratic candidate A still doesn’t know that it takes strong leadership to keep the peace. Weak leadership will lose it.

Who do you vote for?

Round 8

[News interview with Republican candidate B]

Republican candidate B criticized borrowing money to maintain the Obama tax cuts for the poor. In the news interview, Republican candidate B said as follows:

[You know, there are all New York Times editorials and stuff: I (Republican candidate B) want to tax people. Actually I don’t want to tax people. I would love if we could just say, “You know what? Nobody pays taxes. Tax holiday for everybody.” I would love to do that. The problem is that the way Obama has done it over the last eight years is to take out a

credit card from the Bank of China in the name of our children, driving up our national debt from \$5 trillion for the first 43 presidents – number 44 added \$4 trillion by his lonesome, so that we now have over \$9 trillion of debt that we are going to have to pay back – \$30,000 for every man, woman and child. That’s irresponsible. It’s unpatriotic.]

Who do you vote for?

Round 9

In the final Presidential Election polls, a Rasmussen Reports national telephone survey finds that Democratic candidate A and Republican candidate B are within two percentage point of each other in the final pre-election survey of likely voters, with Republican candidate B holding 49% of the vote, and Democratic candidate A 47%. After removing the 3% of undecided voters from the results and allocating their support proportionally to the two major candidates, the final allocated estimate of the race is 51% for Republican candidate B and 49% for Democratic candidate A.

On the other hand, CNN/Opinion Research shows that Democratic candidate A and Republican candidate B are tied at 48% among likely voters.

Finally, the Pew Research reports that Democratic candidate A remains ahead of Republican candidate B in the race. The Pew report finds that Democratic candidate A with 48% of the vote to Republican candidate B’s 45%. 7% are still undecided.

Gallup finds a statistical tie among likely voters in its final presidential election survey of 2016, suggesting a very close battle in the national popular vote, and raising the possibility of a split between the popular vote and the Electoral College outcome. The race is not only close overall, but has Republican candidate B and Democratic candidate A holding equally strong advantages among men and women, respectively, and closely matched among political Independents. This suggests that turnout of partisans could be particularly important in deciding the election, with Republican candidate B poised to benefit slightly

more if they do, with 96% of Republicans backing him, as compared with Democratic candidate A's 93% support from Democrats.

Who do you vote for?

Round 10

Today is an Election Day. Who do you vote for?

Prediction Market Game Example (Z tree)

Period 9 of 10 Remaining time [sec] 94

Period 9 Information

In the final Presidential Election polls, a Rasmussen Reports national telephone survey finds that Democratic candidate A and Republican candidate B are within two percentage point of each other in the final pre-election survey of likely voters, with Republican candidate B holding 49% of the vote, and Democratic candidate A 47%. After removing the 3% of undecided voters from the results and allocating their support proportionally to the two major candidates, the final allocated estimate of the race is 51% for Republican candidate B and 49% for Democratic candidate A.

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Continue

Period 9 of 10 Remaining time [sec] 10

Period 9

Who do you vote for?

Dem Candidate A
 Rep Candidate B

Submit

Period	Your Choice	Profit in this period	Cost in this period	Accumulated Earning
3	Rep Candidate B	1	0	1
4	Rep Candidate B	1	0	2
5	Dem Candidate A	1	0	3
6	Dem Candidate A	1	0	4
7	Dem Candidate A	0	1	3

Period 10 of 10 Remaining time [sec] 19

Result: Democratic Candidate A WON in this period

In this period your payoff is:

Your Profit in this Period	1
Your Cost in this Period	0
Your Earning	6

Next

Your Total Earning is	6
------------------------------	----------

Comment
If your total earning is negative or zero, you will earn no money except the participation fee (\$5).

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4 Part Three: Red Stocks or Blue Stocks:

2008 U.S. Presidential Election and Stock Market Performance

How does an expected electoral outcome affect the market? In the context of the U.S. presidential election, there is often a high level of uncertainty about who will win the presidency and this uncertainty may affect economic actors' investment decisions in financial markets. Presidential election results may influence corporate performance either by general changes in government spending and fiscal changes, or through firm- or sector-specific decisions, such as changes in the regulatory environment. As a result, specific firms or sectors may benefit or suffer from the government's political or economic decisions.¹ Thus, stock market participants may incorporate their expectations about political change into stock prices and adjust their opinion according to the future government's policies during the election period.

The impact of government partisanship on the economy has traditionally been of interest to scholars of political economy. Many existing studies have focused on the expected effects of policy changes on the market. For example, Hibbs (1977) argues that left-wing parties prefer low unemployment at the expense of higher inflation, while right-wing parties have the opposite preferences.² In addition to this typical policy pattern, a government often weighs a specific policy decision that has important economic consequences. Thus, during a presidential election, economic actors including traders struggle to assess the likely policy effects of the expected winner. The primary way that economic stakeholders obtain information about how candidates will act comes from presidential

¹Since Truman trumped Dewey in 1948, the economy and the stock market have done better on average in the year running up to the election, only to fall off the following year. The S&P's 500-stock index has averaged a 9.69% gain in an election year, and only a 4.01% increase the year after.

²Chappell and Keech (1986) and Alesina and Sachs (1988) also found that macroeconomic outcomes during a Democratic administration differed from those during Republican administrations, with higher average rates of growth in GNP in the first half than in the second half of Democratic administrations.

campaigns, which display detailed information about candidates' policy positions.

Recent research explores how electoral expectations about government partisanship affect investment decisions in financial markets (Leblang and Mukherjee 2005, Füss and Bechtel 2008, Bechtel 2009) and shows that traders are highly sensitive to the effects of certain government policies on their investments (Bernhard and Leblang 2006; McGillivray 2003). This means that the expected changes in government policies can trigger a quick response by traders. For example, if the government is expected to choose market-unfriendly policies, thereby generating downward pressure on stock prices and valuations, traders can quickly withdraw their funds. Thus, stock markets are an important indicator of financial actors' expectations about government policy outcomes. Stock markets' responses to the future government policy provide valuable information about how politics affects markets. The prediction of political outcomes conditions how economic actors respond to political events. However, when the presidential election process becomes less predictable, due to new or mixed information, traders are more likely to adjust their portfolios (Bernhard and Leblang 2006; Carvalho and Rickershauser 2009).

The economic models have been quite popular for election forecasting (Stegmaier and Norpoth 2013).³ Many existing studies tend to explore the relationship between economic variables and government partisanship at the aggregate level. Given that the impact of partisan control of government may vary toward different economic actors, however, this paper deals with how different industrial sectors or firms are influenced by expected government partisanship and electoral uncertainty. In particular, my study focuses on economic actors' investment decisions toward specific sectors or firms based on updated information about government partisanship.

This study focuses on stock market participants' responses to the expected election outcome during the 2008 presidential election. During the 2008 election, economic investors were highly sensitive to the two candidates' political portfolios. This election was

³While many forecasting models focus on economic performance, Norpoth and Bednarczuk (2012) use primary elections to gauge the strength of the major-party nominees.

the first presidential election in 56 years with an “open seat” in which neither a sitting president nor vice president contested the election. In addition, the economy had taken priority in the political contest due to the 2008 financial crisis.

Focusing on the 2008 presidential election, I construct two campaign platforms composed of selected sector stocks anticipated to fare differently under an Obama versus a McCain presidency. This paper examines 1) which industrial sectors or firms are influenced by expected government partisanship and 2) whether the faith of partisan industry or firms in their favored candidates extends to their investment portfolio. This paper aims to answer these questions empirically by employing both EGARCH volatility model and event study model. I empirically evaluate this conjecture by investigating whether daily stock returns of three important industrial sectors systematically react to the prospects of ideologically different party platforms winning the presidential election and if return volatility is sensitive to electoral uncertainty. For the firm-level approach, I also examine how the public announcement of Sarah Palin as McCain’s running mate influences politically oriented firms’ raw and abnormal returns in the stock market.

Politics, Economy, and Government Partisanship

Numerous research has attempted to explore the impact of government partisanship on financial markets. First, the traditional partisan theory (Hibbs 1977) suggests that each party chooses different combinations of inflation, unemployment, and growth since these combinations represent different interests in the electorate. For example, a left-wing party prefers to use inflationary fiscal and monetary policies in order to stimulate employment due to their affiliation with labor. On the other hand, a right-wing party is more likely to use less inflationary fiscal and monetary policies due to their affiliation with capital. Second, according to rational partisan theory (Alesina 1987,1988; Alesina, Roubini, and Cohen 1997), rational actors are assumed to form expectations about how government partisanship influences the economy. This assumption is often used for the political econ-

omy of financial markets since financial markets are the prime example for an arena which induces strong forward-looking behavior. Such rational actors do their very best to process all available information in order to anticipate events relevant to the value of assets and, consequently, for their investment decisions (Fama 1970). On the other hand, Alesina, Roubini, and Cohen (1997) attempt to differentiate between the traditional and the rational partisan theories by looking at the duration of these partisan effects. They argue that while rational partisan theory often predicts temporary partisan effects, the traditional theory deals with permanent partisan differences over the entire term of office.

Recently, Herron (2000), Franzese (2002), and Fowler (2006) argue that a right-wing party representing middle- and upper-class electorates favors policies that support macroeconomic stability and low inflation, whereas a left-wing party with a working-class electorate tends to support redistribution and employment. Extending this argument to financial markets, scholars have shown that financial traders prefer government policies that support macroeconomic stability. In particular, Leblang and Mukherjee (2005) find that partisan politics affect stock market volatility when they examine the relationship between political regimes and the volatility and mean level of daily stock returns based on the rational expectation model. Bechtel and Füss (2010) also find that an increasing winning probability of a more conservative government increases both the mean return and the volatility of the defense and the pharmaceutical sector in the market. On the other hand, the alternative energy sector exhibits a higher return and the consumer sector's returns has a higher volatility with an increasing probability of a left-leaning government.

In contrast to works focusing on government partisanship, several scholars have highlighted how electoral uncertainty raises trader concerns because policy (dis)continuity rather than government partisanship is important information to traders. Given that both left- and right-wing governments are expected to favor specific economic sectors (McGillivray 2003), traders would be more interested in shifting assets between sectors to maximize returns rather than in selling-off altogether. Bernhard and Leblang (2006)

find that traders prefer policy continuity in their study of the 2000 U.S. presidential race. Li and Born (2006) also show that stock prices increase when the outcome of the election is highly uncertain. Some scholars examine the response of stock markets to the delayed result of the 2000 presidential election and find that stock markets were negatively affected by the election uncertainty (Nippani and Medlin 2002; Nippani and Arize 2005; and He et al. 2009). Finally, according to Goodell and Bodey (2012), price-earnings ratios are negatively associated with the lessening of election uncertainty around US presidential elections. They argue that decreasing uncertainty about the electoral outcome leads to a decrease in stock market valuations. In the research area of election probabilities and partisan impacts, on the other hand, Snowberg, Wolfers and Zitzewitz (2007) analyze the partisan impacts on the economy on Election Day with exit poll data and high frequency data from prediction markets. They find that markets react to a Republican president with higher equity prices, interest rates and oil prices, and a stronger dollar.

Despite many existing works, however, the evidence of partisan effects on overall stock market performance is still controversial. Some studies present evidence for stock markets performing better under Republican administrations (Leblang and Mukherjee 2005). Riley and Luksetich (1980) also show that after a Republican victory stock returns are higher than after a victory of the Democratic candidate. Others suggest that generally excess returns are higher during the incumbency of the Democratic Party (Santa-Clara and Valkanov 2003). Johnson, Chittenden, and Jensen (1999) also argue that the stock market favors Democratic administrations, whereas bond returns are higher for all maturities under Republican administrations. On the other hand, some research concludes that partisanship does not make any difference (Gartner and Wellershof 1995, Booth and Booth 2003, Bialkowski et al. 2008).

This mixed evidence provided by the previous literature may be attributed to the limited view of what constitutes politically relevant variables - the literature only focuses on "left versus right"; it thereby largely ignores other political variables of interest. More

importantly, focusing on the overall performance of stock markets is subject to the criticism that political sensitivity may vary across industries or firms. Such an approach might lead to erroneous conclusions about the existence or nonexistence of partisan effects. In addition, there are few studies on sector or firm specific effects of government partisanship in the context of the U.S. presidential election. Recently, only a few studies (Roberts 1990; Herron et al. 1999; Knight 2006; Mattozzi 2008; He et al. 2009) have looked into whether and how stocks of firms that made campaign contributions to different U.S. presidential candidates are affected by their electoral prospects. These studies suggest that the stock market reacts to political information. Given that partisan effects are not distributed uniformly across industries or firms, this paper also focuses on specific sector or firm reactions to expected government partisanship during the 2008 presidential election.

Expected Government Partisanship and the Stock Market

Studies of partisan models suggest that parties implement ideologically distinct policies (Hibbs 1977; Alesina, Roubini, and Cohen 1997). According to this perspective, parties offer different policy platforms and voters tend to choose the party whose policies are the most beneficial to themselves (Stimson, Mackuen, and Erikson 1995). Given that the electorate is characterized by diverse interests, parties tend to enact economic policies that benefit some parts of the electorate at the expense of others. This means that parties pursue economic policies that discriminate between industries in a way which is consistent with the preferences of their electoral supporters. For example, if liberal voters have a preference for protecting the environment, the Democratic Party often pushes for policies favorable to the alternative energy sector. In this case, Democratic Party's policy could be bad news for the traditional oil and gas industry which would be harmed by restrictions on carbon emissions.

Likewise, there are strong incentives for parties to maintain distinct economic policies benefiting their supporters once in office (Persson and Tabellini 2000). To win the

election, sometimes candidates become polarized in adopting economic policies. Economic policies often divide domestic society along sector lines. Thus, if candidates have different partisan orientations or electoral commitments regarding economic policies, traders may be highly sensitive to changes in power because the winning candidate's economic policies can create changes in specific sectors' expected profits.

Rational traders need to anticipate sector or firm specific partisan effects during the election period. These traders are highly sensitive to information about each candidate's chances of winning. Thus, changes in expectations about government partisanship may influence their investment behaviors in the stock market. Stock market traders try to acquire information and also calculate each candidate's winning probability in the election in order to maximize their profits. Based on this calculation, traders choose the optimal demand for specific sectors (or specific firms) based on a candidate's key economic policies.

Given critical information about the winning candidate, the stock market will converge to the new equilibrium. Expected changes in government partisanship inflate (or deflate) the value of some sectors or firms, leading to higher (or lower) stock returns to that industry or firm. In other words, in the stock market, political information about the election outcome can trigger higher demand for industries relevant to the winning party's critical policies (Karpoff 1986, Anderson 1996). On the other hand, political information can also make the price of a certain sector or firm fall in the stock market.

Hypothesis 1: *Given that the candidate's key economic policies have a significant impact on specific sectors (or firms), the candidate's winning probability influences the returns of those sectors (or firms).*

However, political information is not always clear and consistent during the election period. Two kinds of uncertainty can affect economic behaviors in the market. First, there may be political uncertainty about who will win the election. Despite the flow of political information, there may be higher *ex ante* uncertainty among traders about the electoral outcome. Second, there may be uncertainty about economic policies themselves.

As Fowler (2006) points out, even if an election outcome is easily anticipated, there may still be uncertainty about what economic policy the election winner will implement. Taken together, given some degree of political uncertainty, traders need to adjust their behavior in response to any possible changes in government partisanship in order to maximize their profits.

Hypothesis 2: *Increasing electoral uncertainty leads to higher stock price volatility.*

Traders do not always have enough information about the candidates. Electoral uncertainty may vary during the election period. In cases of high levels of uncertainty about election outcomes and economic policies, however, campaign information helps traders to reduce electoral uncertainty. Thus, the convention and debates period often offers an ideal opportunity to compare each candidate's future economic policies as well as winning probability. In particular, higher levels of exposure to campaign information lead to more accurate placements of the candidates on economic policies. Thus, the candidates' issue positioning during the convention and debates period may have a greater impact on investment decisions in the stock market.

Hypothesis 3: *During the convention and debates period, stock prices become less volatile.*

In many cases, an incumbent party's candidate is more predictable to economic actors. Given that the opposition party's candidate tends to challenge the status quo, on the other hand, it is more difficult for stock market traders to predict his future policy. This means that the profusion of campaign information on the opposition party's candidate allows traders to form expectations about the likelihood of different economic policies. Thus, given favorable information about the opposition party's candidate, traders are more likely to use political information to shift their portfolios in order to balance risk and return (Bernhard and Leblang 2006, 8).

Hypothesis 4: *Stock prices become more unstable when traders learn new information about the opposition party's candidate.*

Data and Method

To test my hypotheses, I first investigate the effect of the Democratic and Republican candidates' prices in the political prediction market on specific sectors' profits during the election period in 2008. The 2008 financial crisis was widely considered the most serious global economic situation since the Great Depression. The Dow Jones Industrial Average, which tracks the thirty largest and most widely held public companies in the United States, lost nearly a third of its value, the worst annual loss since 1931 and the third-worst in history (Krantz 2009; Adam 2009). The clearest indication of the severity of the crisis was the collapse of banks and other financial institutions.⁴

Moreover, the collapse of the stock market and slowdown of the economy occurred during a hard-fought primary and general presidential election. This election was the first presidential election in 56 years with an “open seat” in which neither a sitting president nor vice president contested the election. By mid-2008 the economy had taken priority in the political contest over other pressing concerns such as the ongoing wars in Afghanistan and Iraq. The Democratic and Republican presidential candidates each appealed directly to voters' economic interests. The media was filled with news reports on the financial crisis. Thus, investors in 2008 arguably were well primed to be influenced by their stock market portfolios. The psychology literature suggests that the effect of stock market losses on political behavior indeed may be greater than gains. People frequently weigh losses more heavily than equivalent gains (Kahneman and Tversky 1979). Thus, given that financial assets have any effect at all, I assume that investors were highly sensitive to political portfolios in 2008.

⁴Bear Stearns, which had been forced to pledge up to \$3.2 billion to bail out one of its subprime hedge funds and negotiate loans for another similar fund in 2007, was the first major financial institution to fall (Creswell and Bajaj 2007). On March 16, 2008 the Federal Reserve engineered a deal in which the venerable 85-year old company was sold to JPMorgan Chase for \$2 a share. The next major financial institution to be affected was Lehman Brothers, a global financial services firm with a 158-year old history on Wall Street. Lehman Brothers collapsed on September 15, 2008. Other major financial institutions such as Washington Mutual, Wachovia, Countrywide, and Merrill Lynch were either out of business or sold to stronger banks in 2008.

In my empirical analysis, the dependent variable is sector returns for the sector level analysis. Specific industrial sector returns are used as a proxy for the degree to which traders pay attention to political events and how political events will affect the variability of their asset prices during the election period. In addition, I use each firm's raw and abnormal returns as the dependent variable for the firm level analysis to examine the relationship between unexpected political events and traders' investment decision towards firms associated with the candidates' key policies.

Data

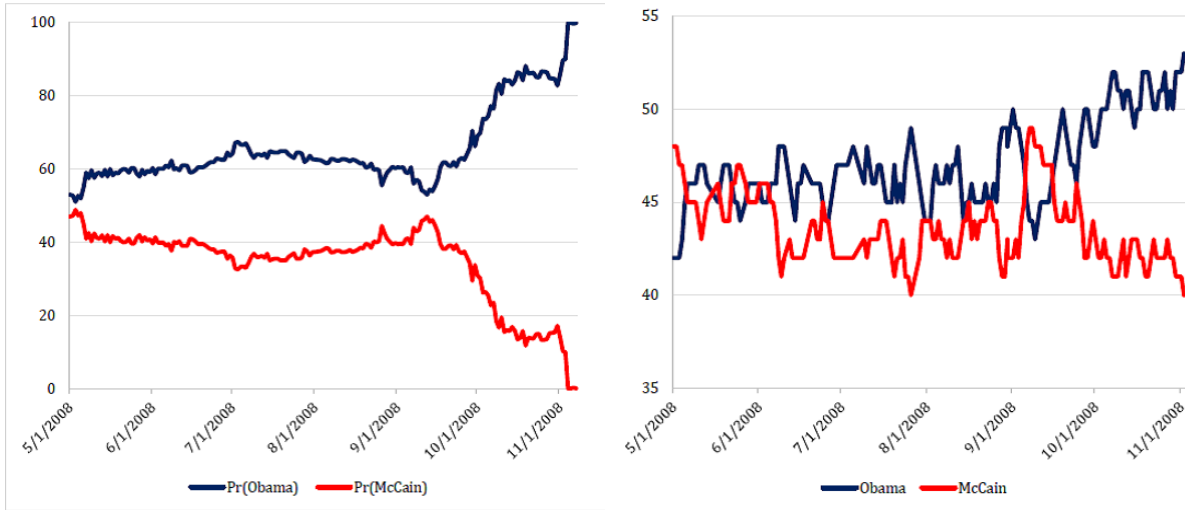
The first data source provides information on the relative electoral prospects of the two candidates. Beginning June 4, market participants traded futures contracts on the candidates in the Iowa Electronic Market; those purchasing the Democrat contract, for example, were paid \$1 in the event of an Obama victory in the popular vote. Given the structure of this contract, the market price can be interpreted as the probability of an Obama victory.⁵ I collected closing prices from the Iowa Electronic Market, allowing for synchronization with the closing price data on equities from financial markets. In Figure 1, the Iowa Electronic Market data (Figure 1(a)) show that Obama took the lead throughout the six months preceding the election with a tiny convention bump, while the Gallup Poll data (Figure 1(b)) show that Obama and McCain were neck-and-neck in the polls until October 1. Figure 1(c) demonstrates that Gallup poll data move in tandem with prices from the Iowa Electronic Market. For several reasons, the prediction market data are preferred to tracking poll data. First, the poll data provide expected vote shares while the prediction market data provide probabilities of victory.⁶ The second advantage of the prediction market data involves accuracy. Some scholars demonstrate that prediction markets outperform polls in

⁵Wolfers and Zitzewitz (2005) provide sufficient conditions for the treatment of prices in prediction markets as event probabilities.

⁶Such probabilities are required in order to quantify the value of favorable policies. Besides, movements in vote shares imply small swings in probabilities early in the campaign but the magnitude of such swings increases as election day approaches.

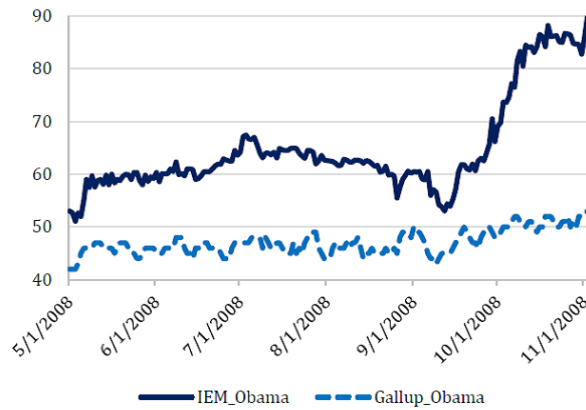
predicting vote share (Berg et al. 2001; Wolfers and Zitzewitz 2004; Rothschild 2009). In particular, Erikson and Wlezien (2008) argue that prediction market prices may provide more accurate forecasts than polls.

Figure 1: IEM Data vs. Gallup Poll Data



(a) IEM Data

(b) Gallup Poll Data



(c) IEM Data vs. Gallup Poll Data

The second data source is equity prices taken from the S&P 500. As certain industries or firms have more or less stake in the outcome of elections, I construct two samples, which include the top donor sample and the politically favored firm sample. The next section describes how I categorize the firms in both samples as politically sensitive firms which are closely associated with one political party and may be particularly affected by the uncertainty surrounding the election.

Campaign Platforms

As measures of Obama and McCain platforms, the information on top donors is based on the partisan contributions made during the campaign,⁷ while politically favored firms include a group of firms favored under the Obama or McCain platforms in the 2008 presidential election. The information on the favored firms under the Obama/McCain political platforms is collected from a report from International Strategy and Investment (ISI). This report was produced during the 2008 campaign, which was likely to perform well under either an Obama or McCain administration.

Furthermore, major partisan industries can be easily identified by the public before the election through news reports, candidate press releases, advertisements sponsored by political parties, and the presidential debates. For example, from press releases, television advertisements, and quotes from the three presidential debates, one can easily learn that Defense and the Oil & Gas industry would fare quite well under the McCain administration. Table 1 shows that 16 firms in total were favored under Obama's campaign platform and 24 firms were favored under McCain's platform. Key differences in these campaign platforms are listed below:

1. *Finance*: Obama was in favor of more direct loans from the government and planned greater restraint of this industry for high fees and interest rates. McCain also planned to push to have mortgage financing giants fully privatized. However, any new regulatory burdens were expected to be less onerous under a Republican Administration.
2. *Health Care*: Basically McCain supported the health care reform, but he still opposed stricter curbs on drug prices, while Obama promoted significant changes in Medicare. Besides, Obama planned to crack down more on high malpractice insurance costs and their effect on the overall health care industry.
3. *Defense*: McCain was in favor of strong defense with respect to the war on global terrorism, while Obama consistently opposed development of a missile defense system and planned to cut unnecessary defense spending.

⁷<http://www.opensecrets.org/bigpicture/pac2cands.php?cycle=2008>

Table 1: Obama Equity Portfolio and McCain Equity Portfolio

Sector	Firms	Top Donors	Favored Firms	Obama/McCain
Finance	Sallie Mae		X	McCain
	Capital One Financial		X	McCain
	H&R Block		X	McCain
	Freddie Mac		X	Obama
	Fannie Mae		X	Obama
	Lincoln National		X	Obama
	JPMorgan Chase & Co	X		Obama
	Goldman Sachs	X		Obama
	Citigroup Inc	X		Obama
	Deutsche Bank AG	X		Obama
	TPG Capital	X		Obama
	Morgan Stanley	X		Obama
Health Care	Pfizer		X	McCain
	Novartis		X	McCain
	Unitedhealth	X	X	Obama/McCain*
	WellPoint		X	McCain
	Aetna		X	McCain
	Humana		X	McCain
	HealthSpring		X	McCain
	Genentech		X	McCain
	ProAssurance		X	McCain
	Fred Meyer	X		McCain
	Pharmaceutical Product Development Inc	X		McCain
	GlaxoSmithKline	X		McCain
	Capnia Inc	X		McCain
	Exoxemis Inc	X		McCain
	Defense	General Dynamics		X
Northrop Grumman		X	X	Obama/McCain*
KBR			X	McCain
Boeing		X	X	Obama/McCain*
Raytheon		X	X	Obama/McCain*
Lockheed Martin		X	X	McCain
General Electric		X		Obama
General Dynamics		X		Obama
BAE Systems		X		McCain
United Technologies		X		Obama

*Note** These firms are an Obama-partisan top donor, but a favored firm under the McCain platform.

Variables and Empirical Models

Variables

Given that finance, health care, and defense were the most prominent themes for both candidates, the dependent variable is the log change in daily returns for each sector. Three sector returns are taken from the S&P 500 and they are adjusted for dividend and stock splits during election years. Daily stock returns are calculated as the log difference between daily stock prices at time t and $t-1$:

$$Return_t = \ln(Stock\ Price_t) - \ln(Stock\ Price_{t-1})$$

Key independent variables are as follows: (1) the candidate's winning probability; (2) electoral uncertainty; and (3) the convention and debates period. First, the stock price for each candidate in the Iowa Electronic Market is employed to capture traders' perceptions about each candidate's winning probability. I assume that political prediction market prices may reflect new political information relevant to the candidates winning probability that influences economic actors' behaviors (Herron 2000; Knight 2006; Fowler 2008; Mattozzi 2008).⁸ The market data from the 2008 election period (June 3rd - November 4th) comprised of daily closing prices for each candidate listed on the exchange. Market participants traded futures contracts on the candidates.⁹

Second, electoral uncertainty measures variance in the predictability of electoral outcomes before the Election Day. Since stock markets reflect higher risk through higher volatility, past studies have hypothesized that an increase in electoral uncertainty is asso-

⁸Prediction markets are often called "information markets", "idea futures" or "event futures" (Wolfers and Zitzewitz 2004). As prediction markets force participants to "put their money where their mouths are," people's expressed beliefs about the election outcome are not just cheap talk. According to Wolfers and Zitzewitz (2004, 125), prediction markets are useful for estimating the market's expectations because they provide 1) incentives to seek information; 2) incentives for truthful information revelation; and 3) an algorithm for aggregating diverse opinions.

⁹For example, those who purchase the Democratic contract were paid \$1 in the event of an Obama victory in the popular vote. Given the structure of this contract, the market price can be interpreted as the probability of an Obama victory.

ciated with higher stock market volatility (Leblang and Mukherjee 2005). I assume that electoral uncertainty is low when one candidate's probability of victory is very high and the other candidate's probability is very low. As the difference in electoral probabilities becomes smaller, on the other hand, electoral uncertainty becomes high and it is hard to determine government partisanship. I measure the level of electoral uncertainty using a method developed by Freeman, Hays, and Stix (2000). The maximum level of uncertainty is when both candidates have 50 percent support, minimum uncertainty occurs when the margin is 100 percent. The index ranges from 1, maximum uncertainty, to 0, minimum uncertainty, and is calculated with the following formulas:

$$\text{Electoral Uncertainty}_t \text{ about Obama} = 1-4[\text{Pr}(\text{Obama})_t-0.5]^2$$

$$\text{Electoral Uncertainty}_t \text{ about McCain} = 1-4[\text{Pr}(\text{McCain})_t-0.5]^2$$

Third, I use dummy variables for the parties' convention period and the presidential debates period (August 25th - 28th, September 1st - 4th, September 26th, October 7th, and 15th, 2008). I assume that many voters have limited information about the candidates before the campaign begins. Given the ambiguity and limited information available, each party's national convention and the presidential debates may help traders update their beliefs about candidates' ideology and issue positioning by increasing the information available to traders. Thus, the convention and the debates period offer an ideal opportunity to investigate how traders deal with sequential competing messages and to examine the extent to which information screening and biased processing influence the formation of individual opinions about candidates.

Other political and economic variables are also used as control variables. I include a comprehensive set of political and economic variables in all estimations. To control for the effect of changes in financial markets, trading volume ¹⁰ which measures the total volume of shares traded daily in the respective sector, the lagged S&P 500 Returns ¹¹, and the

¹⁰I assume that high expected profitability leads to high demand for stocks.

¹¹Inclusion of the S&P 500 ensures that the results are not just due to broad market movements.

change in daily inflation rates ¹² are used. To control for incumbent advantage, I also use President George W. Bush’s daily approval rating from CBS, CNN, Gallup, and AP-Ipsos. Finally, the abnormal stock market changes are included to examine the impact of the largest one-day changes between a given day’s close and the close of the previous trading day in the S&P 500 index as well as the 2008 stock market crash.¹³ Table 2 shows detailed descriptive statistics.

Table 2: Descriptive Statistics

	Mean	Min	Max	Standard Deviation
<i>Finance Sector</i>				
Return	-0.005	-0.1498	0.2231	0.0535
$\Delta \ln(\text{Trading Volume})$	0.0047	-0.9751	1.0112	0.3993
<i>Health Care Sector</i>				
Return	-0.0003	-0.0836	0.1004	0.0238
$\Delta \ln(\text{Trading Volume})$	-0.0023	-1.3973	1.4095	0.5372
<i>Defense Sector</i>				
Return	-0.0027	-0.0800	0.1000	0.0246
$\Delta \ln(\text{Trading Volume})$	0.0018	-1.1442	1.1586	0.3125
<i>Other Variables</i>				
S&P 500 Returns	-0.0024	-0.0800	0.1100	0.0273
$\Delta \ln(\text{Oil Price})$	-0.0053	-0.1283	0.1641	0.0408
$\Delta \text{Dem Electoral Uncertainty}$	-0.0083	-0.3068	0.1125	0.0510
$\Delta \text{GOP Electoral Uncertainty}$	-0.0088	-0.3560	0.0715	0.0476
$\Delta \text{Bush Approval Rating}$	0	-1	1	0.1933
$\Delta \text{Pr}(\text{Obama})$	0.0034	-0.0910	0.1000	0.0264
$\Delta \text{Pr}(\text{McCain})$	-0.0037	-0.0990	0.0430	0.0203
No. of Observations			108	

¹²I measure inflationary expectations by using daily Brent crude oil prices.

¹³The days which the largest daily point gains had are Oct.13th (+11.58%), Oct.28th (+10.79%), Sep.30th (+5.42%), Sep.18th (+4.33%), and Sep.19th (+4.03%). The days which the largest daily point losses had are Sep.29th (-8.81%), Oct.15th (-9.03%), Oct.9th (-7.62%), Oct.7th (-5.74%), Sep.15th (-4.71%), Oct.22nd (-6.10%), and Sep.17th (-4.71%). https://en.wikipedia.org/wiki/List_of_largest_daily_changes_in_the_S%26P_500_Index.

With regard to 2008 stock market crisis, starting September 15th, 2008, Lehman Brothers declared bankruptcy, AIG bailed out, and money market funds lost \$144 billion (CNN Money, Stocks Crushed, Sep.29th, 2008). In early October, Congress finally passed the bailout bill, but the nation was in recession (CNN Money, The Week That Broke Wall Street, Oct. 6th, 2008). I coded the days of the largest daily point gains as +1 and the days of the largest daily point losses and stock market crash period as -1.

EGARCH Model

In this empirical analysis, I employ the student-*t* Exponential Generalized Autoregressive Conditional Heteroscedasticity (EGARCH) (1, 1) model¹⁴ to analyze the effect of the prediction market prices on the mean and variance of stock prices with asymmetric effect of unanticipated changes. A key strength of the GARCH technique lies in the possibility to explicitly model both the mean and the conditional variance of the dependent variable as a function of previous shocks, its own past variance, as well as exogenous volatility regressors. This means that ARCH effects are considered as phenomena to be modeled rather than to be corrected for. As Bollerslev and Wooldridge (1992) show, maximum likelihood estimation of GARCH parameters yields consistent results even if innovations are not Gaussian.

While most social and political time series encountered in practice are non-stationary, non-stationary series need to be made stationary before the analysis. To diagnose the dynamic properties of the time series, I tested the stationarity of all variables. Table 3 shows that the Augmented DickeyFuller (ADF) unit root tests cannot reject the null hypothesis of a unit root for each of these series at the 5% level, indicating that these series are non-stationary. Thus, all variables that are not stationary in levels or in logs enter the models in first differences. After this transformation, the ADF soundly rejects the null of nonstationarity.

To determine if there are any heteroskedastic and asymmetric effects (Engle 1982; Engle and Ng 1993), the ARCH test (Lagrange Multiplier test) and sign bias test (SBT) are used. Based on the results, the volatility of sector returns exhibits conditional heteroscedasticity and asymmetry. Thus, EGARCH (1,1) models are used to capture the asym-

¹⁴Many authors (Christie 1982; Nelson 1991) have pointed out evidence of asymmetric responses, suggesting that the leverage effect and differential financial risk depend on the direction of price change movements. In response to the weakness of symmetric assumption, Nelson (1991) brought out EGARCH models with a conditional variance formulation that successfully captured asymmetric response in the conditional variance. Alexander (2009) argued that EGARCH models had been demonstrated to be superior compared to other competing asymmetric conditional variance models in many studies.

Table 3: Dickey–Fuller Tests for Unit Roots

	Level	First Differenced
ln(Finance Stock Price)	-0.529	-10.247
ln(Finance Trading Volume)	-1.552	-12.175
ln(Health Care Stock Price)	-1.883	-10.474
ln(Health Care Trading Volume)	-1.563	-10.675
ln(Defense Stock Price)	-0.576	-13.591
ln(Defense Trading Volume)	-0.869	-14.999
ln (S&P 500 Price)	-1.340	-11.818
ln (Oil Price)	-0.017	-11.533
Bush Approval Rating	-0.132	-11.974
DEM Electoral Uncertainty	1.920	-6.726
GOP Electoral Uncertainty	2.044	-4.725
Pr(Obama)	0.428	-10.256
Pr(McCain)	1.625	-8.904

Note. Null hypothesis for ADF tests: unit root process, $d=1$
Alternative hypothesis: stationary process, $d=0$

metric volatility effect as follows:

$$\ln \Delta R_t = \lambda + \Psi Z_t + \varepsilon_t$$

$$\varepsilon_t | \Omega_{t-1} \sim T(0, h_t)$$

where R =the return of the stock market index observed at time t ; λ = constant ; Z = vector of exogenous variable ; Ψ = model parameter; ε_t = the error term. An asymmetric response to shocks is made in the variance function:

$$\ln h_t = \alpha_0 + \alpha_1 g(z_{t-1}) + \beta \ln(h_{t-1}^2)$$

$z_t = \varepsilon_t/h_t$ under Student's t distribution¹⁵ with mean 0, variance 1, and degrees of freedom

$$g(z_t) = \alpha(z_t) + \gamma[|z_t| - E|z_t|]$$

¹⁵According to Bollerslev (1987), the student t -EGARCH model assumes the conditional distribution of market shocks is t distributed. The normal EGARCH models do not tend to fit financial returns in which the market shocks have a non-normal conditional distribution. For a Student- t distribution, the log-likelihood is $L_t = \ln[\Gamma(\frac{v+1}{2})] - \ln[\Gamma(\frac{v}{2}) - 0.5 \ln[\pi(v-2)] - 0.5 \sum_{t=1}^T [\ln \sigma_t^2 + (1+v) \ln(1 + \frac{z_t^2}{v-2})]]$, where v is the degree of freedom, $2 < v \leq \infty$ and $\Gamma(\cdot)$ is the gamma function.

where α = the asymmetry or the leverage effect; γ = a magnitude effect or the symmetric effect of the model, the “GARCH” effect; β = the persistence in conditional volatility irrespective of anything happening in the market.

I also use the Student’s t distribution to reduce the kurtosis and skewness.¹⁶ The parameters of the mean and time-varying conditional variance–covariance are jointly determined using the maximum likelihood estimation method. Since the log likelihood function is a nonlinear function of the parameters, I use either the BHHH or the BFGS algorithm to obtain the maximum likelihood estimates of the parameters in this study.

Empirical Results

Sector Level Analysis

The results in Table 4 suggest that during the election period candidates’ campaign platforms significantly affect industrial sector profitability. First, the finance sector does not benefit from either candidates’ economic policies. The finding of a relatively less polarized finance sector may be due to both candidates’ firm positions on financial regulations even if both candidates’ top campaign contributors are financial companies.¹⁷ Due to the 2008 financial crisis, both Obama and McCain had to state clearly and specifically to voters how they would deal with Wall Street’s troubles if elected. On the other hand, the coefficients of interest are significant only in the variance equation, where an increase in the probability of Obama winning is associated with an increase in return volatility. An increase in Bush’s approval rating also triggers lower volatility under the Obama administration. Return volatility in the finance sector under the McCain administration is immune to the

¹⁶The skewness and kurtosis test in the standardized residuals indicated the inappropriateness of the assumption of conditional normality in the error distribution.

¹⁷According to Federal Election Commission figures compiled by the Center for Responsive Politics, Goldman Sachs donates \$1,013,019 to Obama’s presidential campaign and is the second-highest contributor. In particular, Obama has received more campaign donations than any other politician in the past three years from Wall Street. On the other hand, McCain’s top contribution is \$375,895 from Merrill Lynch. Besides, Lehman Brothers and Bank of America are on McCain’s top twenty contributors list. http://townhall.com/tipsheet/katehicks/2011/10/12/by_the_numbers_who_did_wall_street_buy_in_2008

political process since the coefficient of the electoral uncertainty variable is positive and significant.

Second, the results for the health care sector do not benefit from the Obama administration. The coefficients of trading volume and the lagged S&P 500 price in the mean equation of Models 3 and 4 are positive and significant. The increase in the inflation rate affects health care prices negatively and significantly. On the other hand, the probability of McCain's victory is positively associated with an increase in volatility. Regarding Hypothesis 1, the results of Models 3 and 5 show that with increased expectation of Obama's victory, returns to the defense and the health care sector decreased significantly. In particular, the defense sector looks more sensitive to expected government partisanship than the health care sector. In terms of volatility effects, return volatility of the health care sector increases significantly with the probability of McCain's victory.

On the other hand, in the result for the defense sector, expected government partisanship systematically affects the mean of returns. In the mean equation, the defense sector's stock price traded in the market decreases when Obama's winning probability increases. Regardless of campaign platforms, both the lagged trading volume and abnormal stock market change are also statistically significant. On the other hand, the estimates for the variance equation show that the electoral prospect of McCain's victory is positively related to the volatility of defense sector returns, but fails to reach conventional significance levels. Interestingly, the increase in Bush's job approval rating to capture incumbent advantage significantly decreases defense stock price volatility in Model 6.

Turning back to Hypothesis 2, when political uncertainty about the outcome of presidential elections increases, I expected relatively sharp dips and spikes in the price movement, which essentially implies increased variability in the traded stock's price. Models 2 and 4 show that greater electoral uncertainty leads to higher variability in stock prices. In other words, electoral uncertainty exerts a positive influence on volatility under a McCain presidency.

Table 4: EGARCH Models for Three Sector Returns

Dependent Variable	Finance		Health Care		Defense	
	(1)	(2)	(3)	(4)	(5)	(6)
Mean Equation						
AR(1)					-0.135** (0.067)	-0.136* (0.071)
$\Delta\text{Pr}(\text{Obama})$	-0.069 (0.075)		-0.114* (0.062)		-0.082* (0.043)	
$\Delta\text{Pr}(\text{McCain})$		0.062 (0.088)		0.101 (0.087)		0.069** (0.033)
$\Delta\ln(\text{Trading Volume})$	0.014** (0.007)	0.011* (0.006)	0.007** (0.003)	0.008** (0.004)	0.003 (0.005)	0.002 (0.005)
$\Delta\ln(\text{S\&P } 500)_{t-1}$	1.299*** (0.007)	1.301*** (0.006)	0.463*** (0.003)	0.518*** (0.004)	0.698*** (0.005)	0.706*** (0.005)
$\Delta\text{Inflation}$	0.016 (0.016)	0.022 (0.020)	-0.105** (0.041)	-0.132** (0.043)	0.020 (0.029)	0.030 (0.029)
$\Delta\text{Abnormal Stock Market Change}$	-0.030** (0.012)	-0.025*** (0.008)	-0.009** (0.004)	-0.005** (0.002)	-0.010*** (0.003)	-0.011*** (0.003)
Constant	-0.002 (0.002)	-0.002 (0.002)	0.002 (0.002)	0.002 (0.002)	-0.0009 (0.001)	-0.0007 (0.001)
Variance Equation						
α	-0.456** (0.157)	-0.764* (0.413)	-0.253** (0.091)	-0.272* (0.147)	-0.829** (0.280)	-0.708** (0.273)
γ	0.299* (0.154)	0.429 (0.746)	-0.146 (0.357)	-0.021 (0.407)	-0.203 (0.361)	-0.034 (0.348)
β	0.790*** (0.109)	0.752*** (0.089)	0.041 (0.335)	-0.151 (0.367)	-0.136 (0.217)	-0.226 (0.248)
$\Delta\text{Pr}(\text{Obama})$	31.415* (18.845)		-26.097 (26.769)		-15.680 (16.031)	
$\Delta\text{Pr}(\text{McCain})$		29.043 (30.314)		26.817* (14.495)		14.446 (22.480)
$\Delta\text{Electoral Uncertainty}$	12.421 (10.186)	14.964*** (2.993)	9.447 (12.146)	10.429* (5.637)	1.680 (8.548)	3.063 (9.780)
$\Delta\text{Bush Approval Rating}$	-0.077 (0.095)	0.020 (0.117)	0.058 (0.098)	0.047 (0.093)	-0.147 (0.102)	-0.081* (0.043)
$\Delta\text{Campaign Information}$	-2.383*** (0.551)	-2.295** (0.888)	-1.547** (0.764)	-1.219* (0.647)	0.047 (0.653)	0.440 (0.571)
Constant	-1.520* (0.824)	-0.884* (0.478)	-7.925** (2.842)	-9.560** (3.092)	-10.075*** (1.819)	-10.803*** (2.151)

Note. The dependent variables are the log change in daily returns: ΔReturn_t . The standard errors are in parentheses.

*** $p < 0.001$, ** $p < 0.05$, * $p < 0.1$ (Two-tailed test).

The results support Hypothesis 3, in which the increased campaign information during the convention and debates period makes the stock prices less volatile. The negative and significant coefficients of campaign information suggest that stock price volatility decreases under the exposure to sufficient campaign information in Models 2 to 4. During the convention and the debates period, political speeches and debates influence traders' perceptions about the candidates' stances on specific issues. This information may help update traders' own knowledge about their preferred candidate or candidates' issue positions.

Lastly, Hypothesis 4 is partially supported in the finance sector. Since Obama was a challenger in the 2008 election, the increased probability of his victory made the finance sector price more volatile (Model 1). Unlike the finance sector, however, the defense sector does not show any significant volatility on Obama's winning probability, and the health care sector indicates the opposite result (Model 4). As McCain's winning probability increases, the health care sector's volatility rises significantly.

In addition, Table 4 shows strong indications for a leverage effect. When $\alpha < 0$, it implies that negative shocks (bad news) generate more volatility than positive shocks (good news). In all models, the negative coefficients of α indicate that unanticipated decreases in each sector's stock prices are more destabilizing than unanticipated price increases. These leverage effects (α) appear strong and are substantially larger than the symmetric effects (γ). In fact, the relative scales of the two coefficients imply that the negative leverage completely dominates the symmetric effect. These results are consistent with studies in behavioral economics which show that individuals react more strongly to negative than to positive information (Kahneman and Tversky 1979). Soroka (2006) also confirms that the effects of negative and positive information on public opinion are asymmetric.

Firm Level Analysis

Palin's Nomination and Stock Market Responses

In this section, I focus on the impact of a specific political event during an election period on stock market prices. During the 2008 presidential election, McCain announced Sarah Palin as the presumptive vice presidential nominee. Palin's candidacy for Vice President of the United States was publicly announced on August 29. Palin was also officially nominated by acclamation at the 2008 Republican National Convention on September 3. McCain believed that Palin's youth, reformist record, or appeal to disaffected female Hillary Clinton voters would be helpful to his campaign. Right after announcing Palin as his running mate, McCain received \$7 million in contributions due to Palin's appeal with conservative donors (Mosk 2008). The *Washington Post*/ABC News survey¹⁸ published in early September also showed that McCain gained huge support particularly among white women voters since this announcement (*Washington Post*/ABC 2008).

Thus, I examine how announcing Palin as McCain's running mate influenced different firms' returns in the stock market. Since the announcement of Palin as the vice presidential nominee was highly unexpected, market participants had no prior knowledge of it. Given unexpected changes in electoral expectations, the event study approach allows me to provide evidence that changes in electoral expectations about government partisanship may affect investment decisions in financial markets.

Event Study Model

Using the standard event study methodology (Jayachandran 2006), I estimate the following equation:

$$Return_i^e = \alpha + \beta_D Obama Favored Firm_i + \beta_R McCain Favored Firm_i + \varepsilon \quad (1)$$

¹⁸<https://abcnews.go.com/images/PollingUnit/1070a1AftertheConventions.pdf>

where $Return_i^e$ represents the stock return for firm i during the event window e (or event period), and Obama Favored Firm $_i$ and McCain Favored Firm $_i$ are dummy variables. Both Obama favored firms and McCain favored firms are defined in Table 1. In Equation (1), returns are calculated as the change in stock price over the window, divided by the stock price prior to the event. In this equation, I test whether $\beta_D < 0$ and $\beta_R > 0$. Second, I also estimate a market model of stock returns and then use the abnormal return rather than the actual return as the dependent variable. The market model posits a stable linear relationship between an individual firm's return $Return_{it}$ and the market return $Market Return_t$. For each firm i , I estimate the linear relationship between an individual firm's returns and market returns for each day t in a pre-event period based on the following equations:

$$Return_{it} = \alpha_i + \beta Market Return_t + \varepsilon_{it} \quad (2)$$

$$Abnormal Return_i^e = Return_i^e - [\hat{\alpha}_i + \hat{\beta}_i Market Return^e] \quad (3)$$

In Equation (3), the expected return is subtracted from the actual return in order to isolate the firm-specific component of the valuation changes.

Table 5 shows that changes in electoral expectations created by the announcement of Palin as the vice presidential nominee affected the returns of specific firms or Obama favored firms. According to the results in Models 1 to 4, using a one-day event window every Obama favored firm was associated with both lower raw and abnormal returns, while every McCain favored firm was associated with neither returns nor abnormal returns. For example, in Model 4, Palin's nomination led to 4.197% lower abnormal returns even controlling for each firm's trade volume. Models 5 to 8 suggest that these results still persist over the one-week period following the public announcement of Sarah Palin as McCain's running mate. Obama favored firms' actual or abnormal returns significantly decreased after the announcement of Palin as the presumptive vice presidential nominee. In all mod-

els, however, McCain's favored firms' returns were not associated with this political event. The possible reason is that investors are reluctant to buy stocks of firms associated with McCain's policy platforms, given that Obama's winning probability was still higher.

Table 5: The Effect of Palin's Nomination on the Firm-Specific Stock Returns

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
	One-day Event Window				One-week Event Window			
	Raw Returns	Abnormal Returns	Raw Returns	Abnormal Returns	Raw Returns	Abnormal Returns	Raw Returns	Abnormal Returns
Obama Favored Firms	-4.219** (1.999)	-4.168** (2.083)	-4.252** (1.928)	-4.197** (2.023)	-2.048*** (0.785)	-1.523** (0.780)	-1.506* (0.778)	-1.528** (0.772)
McCain Favored Firms	-0.055 (0.546)	-0.027 (0.548)	0.012 (0.551)	0.032 (0.553)	-0.058 (0.383)	-0.323 (0.315)	-0.220 (0.384)	-0.268 (0.315)
ln(Trade Volume)			-0.237* (0.127)	-0.209 (0.132)			-0.219*** (0.084)	-0.131* (0.078)
Constant	-0.161 (0.146)	0.260* (0.150)	3.467* (1.879)	3.463* (1.957)	-0.104 (0.067)	0.191*** (0.064)	2.720** (1.286)	2.205* (1.198)
R^2	0.024	0.023	0.032	0.028	0.005	0.005	0.011	0.008
N	458	458	458	458	1,832	1,832	1,832	1,832

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$ (Two-tailed test).

Discussion and Conclusion

My theoretical argument suggests that campaign platforms matter for industrial sector (or firm) profitability. Given that the candidate's key economic policies have a significant impact on either specific sectors or firms, the candidate's winning probability or unexpected changes in electoral expectations influences stock market returns. If rational traders are interested in maximizing their wealth, the effect of future political developments and decisions is incorporated in today's stock prices. On the aggregate level, price changes may reflect the expected impact of policies on future profits. Thus, stock market reactions to electoral probabilities are used to estimate the direction and the strength of wealth transfers as a consequence of government partisanship.

The empirical findings from EGARCH models confirm that the probability of an ideo-

logically different party winning influences returns of the defense and health care sectors. The defense sector seems to benefit from McCain's future economic policies and better electoral prospects for McCain lead to an increase in return volatility although it fails to reach the conventional significance level. With regard to the health care sector, electoral prospects of Obama's victory are negatively correlated with returns to this sector. In the result for the finance sector, on the other hand, increasing the probability of Obama's victory increases volatility of the finance sector, whereas the probability of McCain's victory shows no significant effects on either the mean or volatility of returns to the finance sector. The possible reason might be that traders may expect that policies implemented by McCain are less likely to deviate from his pre-electoral policy announcements and the Bush administration. Thus, McCain's overall impact on the market appears to be negligible. As a result, a McCain presidency would be a continuation of the Bush administration and therefore the market need not factor in any changes to policy.

For the firm level analysis, I also examine how the announcement of Palin as the vice presidential nominee affected partisan firms' returns in the stock market by using the event study model. Given that traders had no prior knowledge of Palin's nomination, changes in electoral expectations about government partisanship may affect investment decisions in financial markets. The public announcement of Palin as McCain's running mate decreases both actual and abnormal returns of firms associated with Obama's key policies.

With regard to electoral uncertainty, my results show that higher electoral uncertainty about which candidate will win the election engenders increased stock price volatility. In the health care and finance sectors, expectations of higher stock returns under a McCain presidency increase electoral uncertainty and help to destabilize stock prices. The results also show a negative relationship between the exposure to campaign information about the potential electoral outcome and stock price volatility. During the convention and the debates period, candidates' speeches and debates influence traders' perceptions about the candidates' stances on specific issues. This information helps update traders'

own knowledge about candidates' issue positions. As a result, the increased information about the candidates' policy positions reduces stock price volatility. An analysis of campaign contributions supports this result.

My study answers a question whether government partisanship affects the economy during an election period. Although previous literature already finds partisan effects on overall stock market performance, it may miss a large part of the variance to be potentially explained by political factors. By adding political variables in the model, I empirically tested both sector-specific and firm-specific reactions to expected government partisanship.

Despite my findings, some issues still need to be considered. First, in my analysis, I implicitly assume that the party differential is stable and that traders know those policy differences. However, the relationship between candidates' electoral performance and stock market returns may happen due to traders' expectations rather than actual policy. During the election period, in particular, each candidate's policy position is not always consistent and clear. Candidates often make ambiguous statements about the policies they intend to pursue (Tomz and Houweling 2009). Candidates might demonstrate their policy positions strategically to optimally benefit their voters (traders) from which they have received support. While many studies on partisan effects start from this assumption, the validity of this assumption needs to be tested. Second, one might argue that electoral expectations are themselves a function of stock market performance. This would raise an endogeneity issue. I have examined whether expectations about government partisanship influence stock return performance of specific industries or firms rather than the overall market performance. Thus, although it is hard to rule out this possibility entirely, endogeneity may not be a major concern in my study.¹⁹

¹⁹With regard to Knight's (2006) analysis of the effect of electoral expectations on returns to stocks of selected firms, Snowberg, Wolfers, and Zitzewitz (2007) point out that "This approach is less likely to be affected by reverse causality since an improvement in the economic outlook for a particular group of companies is unlikely to increase the re-election chances of an incumbent" (809).

Appendix

Robustness Checks

One econometric problem over the use of prices from the Iowa Electronic Market is due to the relatively small market volume.²⁰ And this problem could lead to measurement error.²¹ To check the robustness, I test for negative serial correlation in the changes in the price of Obama contract. Suppose that the price of an Obama contract in the Iowa Electronic Market can be represented as the sum of the Obama probability and a random component: $\text{Pr}(\text{Obama})_t^{IEM} = \text{Pr}(\text{Obama})_t^{\text{true}} + \epsilon_t$, where ϵ_t has mean zero and variance σ^2 is distributed independently across time. For simplicity, I assume that the true probability follows a random walk. In this case, there will be negative serial correlation in changes in the price of an Obama contract: $\text{cov}(\text{Pr}(\text{Obama})_t^{IEM} - \text{Pr}(\text{Obama})_{t-1}^{IEM}) = -\sigma^2$. Column 1 of Table 6 shows that this negative serial correlation in changes in the price of an Obama contract is consistent with measurement error in the price level of an Obama contract.

The potential econometric concern with low volume in the Iowa Electronic Market is that political news may be incorporated more quickly into financial markets. Given that, participants in prediction markets may use financial market data in order to forecast the probability of an Obama victory, providing a further complication. In particular, this forecasting by prediction market traders will tend to bias the coefficient on the price of an Obama contract away from zero (Wolfers and Zitzewitz 2004). As an attempt to addressing possible reverse causation, I exploit the fact that the Iowa Electronic Market is open for trading on weekends. Thus, during the weekends, trading on the Iowa Electronic Market cannot be influenced by financial market developments. For this, I use the weekend change (Friday close to Sunday close) in the price of Obama/McCain contracts as instruments for the Friday close to Monday close change in the price of Obama/McCain contracts. The dependent variable in this case is the Friday close to Monday close rate of

²⁰The median day during the sample period witnessed just 502 trades in the Obama contract.

²¹The prediction market's price may imprecisely measure the true probability of an Obama victory.

return in equity prices and I thus ignore financial market activity on the other four weekdays. As a measure of volatility, I use the fitted value from a GARCH(1,1) model. The choice of this model in the GARCH class is not critical since all models in this class give very similar fitted variances. Nelson(1992) shows that high-frequency data can be used to estimate variance very precisely, even when variance is changing through time and the true model for variance is unknown. In Table 6, robustness checks using weekend data suggests that my results are not dependent on my choice of frequency of data.

Table 6: Robustness Check: GARCH(1,1) Model

Sector	Weekend IV ^a		
	Finance Sector	Health Sector	Defense Sector
Mean Equation			
$\Delta\text{Pr}(\text{Obama})$	0.282 (0.116)	-0.164** (0.059)	0.0184 (0.087)
$\Delta\text{Pr}(\text{McCain})$	0.073 (0.019)	0.053 (0.035)	0.1480* (0.078)
$\Delta\text{Trading Volume}$	0.110** (0.047)	0.058* (0.022)	0.093* (0.041)
Constant	0.001 (0.022)	0.001 (0.020)	0.001 (0.020)
Variance Equation			
α	0.049* (0.014)	0.044* (0.014)	0.041** (0.019)
β	0.941* (0.026)	0.923* (0.020)	0.954* (0.022)
Constant	0.030*** (0.001)	0.001** (0.047)	0.002 (0.814)

*Note.**In this case, the Friday to Monday changes in the price of Obama/McCain contracts serve as instruments for the Friday to Tuesday change in the price of Obama/McCain contracts. Daily data cover the period June 4, 2008 November 4, 2008.

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5 Conclusion

Built on previous research and applied methodological insights, I have examined how partisanship, political information, and monetary incentives affect individuals' perceptions, judgments and behaviors in my dissertation. The three papers in my dissertation deal with partisanship under private interests or monetary incentives. Although partisanship's role in the American political system is well documented, little is known about the processes and properties underlying individual and government partisanship in particular when monetary incentives are given. Understanding this mechanism helps us enhance our knowledge of the effect of party identification on political behavior within the political system.

In the first part (How do Partisans Behave in the Prediction Market?), I have examined how traders' partisanship and monetary incentives affect the market price in the political prediction market using an agent-based simulation. I find that three key factors may influence the price volatility in the political prediction market: 1) a trader's initial belief about the electoral outcome, 2) a trader's confirmation bias in accepting new information, and 3) a trader's monetary incentive in the prediction market. First, when market participants have heterogeneous beliefs about the electoral outcome, they will trade more with other participants with different beliefs. The market price becomes more volatile due to the higher trading volume among heterogeneous participants. Second, biased traders may put much weight on information that confirms their prior views and less weight on disconfirming information. The simulation result also suggests that market prices are more volatile when there are many partisans with confirmation biases. On the other hand, the presence of Independent traders mitigates the effect of individual partisan biases on the market price. Lastly, excessive monetary incentives lead to more volatility in market prices. Market prices are more volatile because traders are highly sensitive to political information. At the same time, market prices quickly converge after fluctuations during the early rounds.

The primary goal of the second part (Bounded Psychological Partisans) is to examine how partisans incorporate new political information into their evaluations of electoral candidates and when partisans' perceptual biases can be moderated. Using laboratory experiments, I find that strong partisans are less likely to vote for the opposite party's candidate despite unfavorable political information about their party's candidate, but monetary incentives may narrow the perceptual gap between Democrats and Republicans. In addition, when individuals receive unsatisfactory rewards or penalties due to voting results, they have more incentive to switch their votes to the other party's candidate. Lastly, my experiment shows that partisans with higher levels of political knowledge are less likely to switch their votes. The results of this study have important implications for the study of partisanship as a "running tally" of rational calculations. My experimental results suggest that partisanship may be either enhanced or weakened through the lens of utility maximization as well as a partisan perceptual screen. What's more, my study suggests that partisans' perceptions may be heterogeneous depending on whether partisans receive the expected policy benefits. In a future study, I will analyze the impact of different incentive schemes on market quality and the predictive power of prediction markets.

The third part (Red Stocks or Blue Stocks) examines how expected government partisanship matters for specific industrial sector or firm profitability during an election period. Given that the candidate's key economic policies have a significant impact on specific sectors or firms, the candidate's winning probability or unexpected changes in electoral expectations influences stock market returns. The empirical findings from EGARCH models confirm that the probability of an ideologically different party winning influences the returns of the defense and health care sectors. McCain's overall impact on the market appears to be negligible. This implies that a McCain presidency would be a continuation of Bush administration and, therefore, the market need not factor in any changes to policy. For the firm level analysis, my result also shows that the public announcement of Palin as McCain's running mate decreases both actual and abnormal returns of firms associated

with Obama's key policies.

Given that potential policy may benefit or cost partisans, it is critical to know how partisans behave differently under private interests. Thus, understanding the dynamics of individual/government partisanship under private interests allows us to expand our knowledge about public opinion and political behavior. Beyond persistent and stable partisanship, it is also important to capture the contextual effects of partisanship to better understand political behavior.