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Modeling The Development & Expression of Political Opinion:

A Zallerian Approach

An Honors Paper for the Department of Government and Legal Studies

By Avery Ellis

Bowdoin College, 2024

Acknowledgments

This thesis has been the labor of a year, yet every page, every sentence has been a true joy to write. Nearly half of my classes at Bowdoin have contributed, in one way or another, to the creation of this work. I feel so incredibly grateful to be able to work on something that means so much to me and that I hope can make a small difference in the world. To combine my lifelong passion for mathematics with the love I have found here for politics has been an incredibly rewarding experience, and a perfect capstone to my undergraduate academic experience. There are so many people who have contributed to this project in varying ways, and it would be impossible to name them all, but there are a few in particular I would like to thank.

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If you are reading this, I hope you find some takeaway that makes you hopeful for the future. Understanding how and why people form their political opinions is crucial for the health of our democracy, and as we fight for a more just and equal world, it is my hope that this thesis can, even in some small way, contribute to creating that roadmap.

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1   Introduction

"Like I've said before, polls are for strippers and cross-country skiiers." -Sarah Palin

What would cause Sarah Palin, former governor of Alaska and Vice Presidential candidate, to cast such doubt on polls? Ideological bias aside, Palin speaks for far more than herself when she cast doubt on the validity of insights and results gleaned from polls. It was 2008 when Nate Silver's *FiveThirtyEight* blog skyrocketed to fame for its usage of poll data to predict election results. In the sixteen years that have passed since then, polling has fallen far from its status as perhaps *the* objective way to gauge public opinion in and attitudes about politics and seems to no longer have the objectivity of other social sciences, especially after high-profile media coverage of the failings of many polls during the 2016 and 2020 elections. However, the fact remains that the release of polls still receive breathless coverage in the media. Polls are still treated as a gauge of the public's opinion, even if the polls themselves and the process by which they are created are scrutinized, compared, and evaluated to no end by individuals and by elites. Furthermore, in any representative or democratic society, a properly conducted poll can seemingly provide insights on public opinion both across and by demographics, which can be an incredibly important tool that allows for large-scale analysis of public opinion and, importantly, can be used by policymakers to understand the wishes and beliefs of their constituents.

On the surface, it seems so simple: a poll should ask an individual's opinion, they report it, and assuming that the pollster has taken a representative sample of the population, we should expect similar results across all polls. So what gives? Why is there seemingly such a disconnect between what opinions people report on a poll and the ones they actually express at the ballot box? Why is it that a tool that provides so much promise and seems so simple generates such controversy? While perhaps the mainstream discussion of polling is relatively new, academics and researchers have been asking these questions for decades and decades. In 1948, Paul Lazarsfeld and his co-authors had polling data to access, but to them, a focus on the result of a poll was not sufficient; what was more important was to understand *why* someone responded the way they did. Lazarsfeld and his co-authors sought not "to predict the outcome of the election, but to discover certain processes underlying opinion formation and political behavior" (Lazarsfeld et al. 1948, 2). Many contemporary doubters of polling focus heavily on methodological critiques: sample size, representativeness,

pollster bias, and other such issues. This thesis will not focus on such methodological issues, but aims to go deeper. Over seventy-five years later, the basic question that this thesis seeks to answer is one that heavily echoes Lazarsfeld and is only a slight abstraction away from those aforementioned simple questions: *how do people make up their minds about politics?*

In light of Palin's quote and the discourse surrounding polling in today's world, Lazarsfeld's lofty goal seems all the more prescient. Most contemporary discussion around polling is based off toplines and crosstabs, with perhaps a bit of analysis about the bias of the pollster. However, if researchers nearly eighty years ago can recognize it is necessary to go deeper than percentages and to analyze the factors that cause those opinions to form, perhaps it is high time for contemporary discussions and understandings of polling to follow suit. Polling, despite all its flaws, remains an incredibly vital tool for gauging large-scale opinion in today's society and, in order to preserve that, it is vital to understand the mechanisms that undergird it and to therefore be able to analyze how and why people make up their minds about politics. Through this work, I hope to make a slight contribution to the literature of how people develop and change their political opinions by combining a mathematical, psychological, and political evaluation of the ways in which opinion formation and change happens. Furthermore, because I factor in analyses of media environments, psychological models of opinion formation, Bayesian statistics, and politicization of issues, I hope to show that this question is a complicated one that requires a nuanced and wide-ranging approach to analyze. In order to do this, I begin with John Zaller's 1992 book *The Nature and Origins of Mass Opinion*, a titan in the field of political behavior.

Chapter 2 of this thesis begins with an outline of Zaller's incredibly concise yet powerful Receive-Accept-Sample model, where I will explore in detail Zaller's model setup and unpack his dense, theoretical writing. In Chapter 2, I will also evaluate the work of several authors who utilize and evaluate *Mass Opinion*, and then further analyze the literature that critically evaluates Zaller. In Chapter 3, I build on the rich methodological tradition espoused by *The People's Choice*, *The American Voter*, *The Nature and Origins of Mass Opinion*, along with so many other giants of political science, and attempt to make some slight contribution to the broad theory of political behavior by trying to understand the giant question of how people form their political opinions. I construct an updated version of Zaller's model to account for a new

informational environment and to allow for a broader understanding of messaging utilizing a motivated reasoning approach and an application of Bayes' Theorem and a thorough mathematical embedding of Zaller's theory. Chapter 4 continues with a further review of Zaller's work as a means to construct a test of Zaller's model and my own, and sets out the conditions required for a proper analysis of the empirical and theoretical hypotheses generated from my work. Chapter 5 comprises an analysis of my model and Zaller's via the 2016 British referendum on membership in the European Union, where I argue that shifts in the ways in which modern-day messaging pervades popular consciousness suggest my model's utility yet still affirm Zaller's work. Finally, in Chapter 6, I will conclude my work by analyzing its place in the literature and potential future directions.

Overall, this thesis' contribution consists of several key areas, each of which I will briefly outline. First, its critical take-up of *The Nature and Origins of Mass Opinion* presents what appears to be the first paper since 2008 to critically analyze and to contextualize the theory behind the work, which I argue is necessary considering the widespread changes in the ways in which people engage with politics. Next, I hope this thesis makes it incredibly clear how difficult this topic is: understanding how people make up their minds about politics is a complicated and interdisciplinary inquiry and requires a careful and nuanced approach, requiring a mathematical, psychological, and political analysis. Further, in offering a way to build on Zaller's work, this thesis presents a roadmap to continue understanding how and why people form their political opinions. By contributing to this theory, it is my hope that this thesis shows that polling, methodological issues aside, is still a crucial tool to understand the flow and change of public opinion.

The analysis and results presented in this work suggest that things are not as dire as they may appear: while a single horse-race poll may not be able to adequately describe or explain the state of public opinion, by asking thoughtful questions and tracking how peoples' attitudes change over time, it is still possible to glean accurate insights about politics. We may yet be able to rely on polling and analysis of polls to guide policymaking and to potentially predict elections, despite the doubts cast upon the very foundations of the science behind polling. Through reading this thesis, I hope it becomes clear that there are decades of research supporting this hopeful note. Especially as we approach the hotly contested 2024 Presidential election, where polls and their relative merits will surely be highly contested, it is all the more critical to

understand how people construct their attitudes and to understand the state of mass opinion and how it shifts.

2 *The Nature and Origins of Mass Opinion*: Review & Analysis

"All models are wrong, but some models are useful." -George Box

2.1 A Brief History of Political Behavior Research

John Zaller's *The Nature and Origins of Mass Opinion* is the primary focus of this thesis, but like every significant piece of research, it stands upon the shoulders of many other significant works. In order to contextualize Zaller's writing and where *Mass Opinion* sits in the literature, I will begin this thesis with a short outline of the history of political behavior research and briefly analyze three major works from the middle of the 20th century whose results significantly influenced and informed the development of *Mass Opinion*.

The major influence of polling and the analytical approach to politics that it symbolizes is a relatively recent development. It was only in the first half of the 1900s that an attempt to turn politics into an objective science, on par with other social sciences and hard sciences, began in earnest. University of Chicago professor Charles Merriam, in a meta-review of the political science profession, bemoaned the fact that, as of 1921, "in many ways, politics has been outstripped in the race for modern equipment supplying the rapid, comprehensive and systematic assembly and analysis of pertinent facts" (Merriam 1921, 175). He hoped to utilize statistics to "throw much clearer light upon the political and social structure and processes than we now have at our command" (ibid. 180). As statistical techniques began to evolve, many surveys were conducted in the United States to analyze attitudes or to gauge opinions, ranging from the Progressive movement's attempts to understand farmers' opinions (Converse 1987, 26-27) to more formal political analyses.

Merriam's wishes would soon be granted, though. Harold Gosnell, one of Merriam's colleagues at the University of Chicago, created what Jean Converse calls "perhaps the first field experiment in the social sciences outside of psychology", a survey on non-voting (in 1924), followed by a study on getting out the vote in Chicago's mayoral election, in 1927. Gosnell's work, along with that of other members of the University of Chicago, is credited as "pioneering" and as inspiring the "behavioral revolution" by historian of social science Jean Converse (ibid. 84). Ten years later, pollsters Archibald Crossley, George Gallup, and Elmo Roper utilized the new sciences of polling (borrowing heavily from the world of market research in business)

to correctly forecast Franklin Roosevelt's win in the 1936 presidential election. This win led to a surge of interest in polling as "purposeful, public-spirited work in a context of political optimism and democratic idealism" (ibid. 121). Crossley proclaimed that polling held "the long-sought key to government *by* the people," and the scientists saw themselves as "providing a continuous measurement of public opinion which would supplement and strengthen the normal operations of representative government and protect it from the domination of lobbyists and special interests" (ibid. 122). While perhaps a rather grandiose view of itself, the fact remains that from the beginning of its widespread acceptance, proponents of polling have always viewed it as having the potential to change representative democracy for the better and redefine understandings of public opinion.

After the 1936 election and the arrival of polling on the scene of politics, it was not only the utility of polling that evolved, but also the science behind how polls were conducted. As the mathematical world began to evolve its understanding of probability sampling and randomization, exemplified through the work of R.A. Fisher, the techniques of mathematics found a natural home in academic political scientists, as they tried to develop a nuanced understanding of the cognitive mechanics behind a poll response in order to conduct better surveys. During the mid-20th century, two works stand alone as giants in the study of political behavior.

The first one, titled *The People's Choice*, was, on the surface, just a study of voting in Erie County during the 1940 presidential election. However, *The People's Choice* has had a lasting and sustained impact in academia and throughout political science as a whole because it represents so much more than that. The authors, in an analysis of the current state of the study of political behavior, note that the recent "public opinion polls [...] made much more precise the study of certain determinants of vote and, to some extent, they made possible the study of the development of vote during a presidential campaign" (Lazarsfeld et al. 1948, 2). However, as quoted in the introduction, they sought to go further–not "to predict the outcome of the election, but to discover certain processes underlying opinion formation and political behavior" (ibid. 8). This represents perhaps the first attempt to develop a scientific theory to understand why and how people respond to questions on public opinion polls. In the preface, Paul Lazarsfeld and his co-authors noted that "from poll findings [...] [people] have gained the impression that such research is content to describe how

people feel about a given issue at a particular time" (ibid. xxi). However, with *The People's Choice*, the authors seek to go further than this, to focus more on the general "formation, change, and development of public opinion" (ibid. xxii). This attempt to focus less on the finer-grained details of the individual and more on the broad societal factors presents *The People's Choice* as a first move towards a working theory of public opinion. However, the authors, in an astute recognition of their own place within the theory, note that their results "are generalizations which form a bridge between the facts as they are observed and a more systematic theory which still awaits development" (ibid. xxxi). While in 1948 that theory might have been a goal for the future, it would not be long before other researchers jumped at the chance to continue the study of political behavior through polling.

Angus Campbell, Philip Converse, Warren Miller, and Donald Stokes published *The American Voter* in 1960, laying the next foundational stone in the building of political behavior research. The work by Campbell et al., was described as having "rode the crest of the behavioral revolution" to become "its most prominent example" by Gerald Pomper in a 1978 review of the book's impact (Pomper 1978, 619). Campbell et al. attempt to construct a broad and wide-ranging theory of vote choice, one that creates a framework to fold in an understanding of the relevant conditions that impact a voter's choice, attempts to discern factors underlying the causality of voting rather than those that are simply correlated with it, and attempts to build a system that can reckon with the multifaceted decision that is an individual's choice of vote (Campbell et al. 1960, 18-19, 21, 23). This focus on causality over correlation is part of what distinguishes the approach of the authors, and is furthered by their development of the "Michigan Model", which attempted to define a "funnel of causality" through which different traits influenced a person's vote choice (Brown 2014). Notable for defining party identification as the primary driver of vote choice, the authors of *The American Voter* have earned their accolades not just for their results, but also for their thorough modeling process, in which they define and explicitly analyze the development and process through which a person's vote choice is created (ibid.).

The development of *The American Voter* and *The People's Choice* marked a huge victory for the behavioralists, the political scientists modeling their work after Gosnell and other titans of early survey research. After *The American Voter*, it seemed like a comprehensive theory of how different back-end factors impact

one's vote, while not fully formalized, was at least in the advanced stages. However, as now, there were still a series of unanswered questions, and there was still a significant amount of seemingly inexplicable variance in the ways in which people responded to polls. If the Michigan model held, why was it that people responded differently on surveys administered shortly after another, seemingly without changing their mind? If one reported being a liberal on one question and then expressed support for Nixon on the next, what was going on inside their head? This seemingly inexplicable and contradictory evidence was coalesced by Phil Converse, one of the authors of *The American Voter* in his seminal 1964 study, *The Nature of Belief Systems in Mass Publics.* Converse, through a series of interviews, concludes that the vast majority of the American public has a belief system that he describes as "largely incoherent"; that is, a collection of attitudes that seem from the outside to be logically inconsistent, but to the individual, may seem uncritically true (Converse 1964, 16-18). Converse found that nearly *forty percent* of respondents had no idea what separated the Democrats from the Republicans on the traditional liberal-conservative scale, which cast serious doubt upon the classical ideal of the "rational citizen" (ibid. 24). While Converse did not suggest a specific improvement to the theory being developed by the Michigan school, it was clear that something was left wanting. If what was going on inside someone's head was logically inconsistent, it would make sense that their survey responses would reflect that inconsistency. But why was there inconsistency in the first place? And how exactly did that manifest in polls?

Despite the impact of Converse's work, it was nearly 30 years before the next true giant of the behavioralists came onto the scene to try and answer these questions. In 1992, John Zaller published *The Nature and Origins of Mass Opinion.* Zaller's work went much further into the realm of behavioral theory than Campbell et al. and Lazarsfeld et al. In the words of famous political scientist, Larry Bartels, *The Nature and Origins of Mass Opinion* is "the most significant contribution to the scientific study of public opinion in almost three decades" since *The Nature of Belief Systems in Mass Publics* itself (Bartels 2012, 463). *Mass Opinion*'s goal is nothing short of soaring: in the book, Zaller lays out a grand, unified vision, attempting to "integrate as much as possible of the dynamics of public opinion within a cohesive theoretical system," where he combines the decades of work done Campbell et al. and Converse, among others (Zaller 1992, 6). Zaller begins by examining the field of political science from a birds-eye view, in which the author identifies that

"we know much more about the details of particular dependent variables [ex: turnout, vote choice, political interest, etc] than we do about theoretical mechanisms that span multiple research domains," and argues for a move away from small-scale research to a rigorous theoretical analysis, combining the work of so many. Similarly to the authors of *The American Voter*, the classic work by Angus Campbell, Phil Converse, Warren Miller, and Donald Stokes, Zaller declares that "the public opinion field is long overdue for an attempt to sketch a unified theory of its major empirical regularities," (ibid. 3) and spends nearly two hundred and fifty pages drawing that sketch. What makes Zaller's book so remarkable is how he manages to create a parsimonious model based only on 4 axioms, yet purports to explain the entire developmental process of how people generate political opinions and how they can shift over time.

However, as Zaller himself admits, "the breadth and generality for which I aim [...] has been achieved at the expense of strong assumptions and some important simplifications" (ibid. 2). While to some extent this is inevitable, as "broad social theory and strong results require strong assumptions and significant simplifications" (ibid.), there are a number of authors since 1992 who have taken up Zaller's modeling process and found results that conflict with his model and hypotheses. After evaluating those works, as famous as *Mass Opinion* is, it becomes clear that there is an opportunity to fold in the empirical results found by the critical authors and their suggested theoretical improvements to build on Zaller's work. The work of these critical authors will be evaluated more thoroughly towards the end of this chapter.

2.2   Setup of the RAS Model

The beginning of *The Nature and Origins of Mass Opinion* is, as discussed in the introduction, where Zaller sets out his broad goals of advancing the theory of public opinion via a theoretically integrated and comprehensive model. To do this, after a series of several grand statements about the model-building process and his work's utility, he then moves to begin his process from first principles. Zaller begins by breaking down the specific inspiration for his model and taking care to specifically define a number of terms, which are included here for purposes of clarity. He begins by noting that public opinion on both specific issues and in general is not necessarily directly proportional to the facts of a situation, writing that "Even topics that are within the direct experience of some citizens [. . .] are susceptible to widely different understandings,

depending on how facts about them are framed or stereotyped." (ibid. 13) He continues by declaring his primary independent variable of interest, which he terms *political awareness*, defined as

> "the extent to which an individual pays attention to politics *and* understands what he or she has encountered. Attention alone is not enough [. . .] the key to political awareness, then, is the absorption of political communications" (ibid. 21)

Zaller then proceeds to specify his operationalization of political awareness, the specific way in which he measures the concept. In attempting to acknowledge the aforementioned framing and stereotypes that affect common measures of people's political awareness, Zaller focuses solely on information tests that are strictly neutral or factual; for example, a person who knows the name of their local representative would be more politically aware than one who did not. This, as Zaller writes, "is important in this book insofar as it measures a person's likely level of exposure to this other, nonneutral and not exclusively factual information" (ibid. 22), which is indicated by the fact that, as discussed above, even personal and direct experiences often incorporate potentially biasing frames and stereotypes, which can lead to neutral information being absorbed along with the non-neutral framing.

Zaller's next definitions come with regard to specific terms utilized for organizational purposes. He hones in on two related concepts, values and ideology, which he claims have the same theoretical use, defining *values* as "domain-specific organizing principles" (ibid. 26) and *ideology* as "a more general left-right scheme capable of organizing a wide range of fairly disparate concerns, where the concerns being organized include various value or issue dimensions or both" (ibid). These both are significant for Zaller, as he claims that values and ideology both serve as "indicators of *predispositions* to accept or reject particular political communications" (ibid. 28). Predispositions, in Zaller's words, are "stable, individual-level traits that regulate the acceptance or non-acceptance of the political communications the person receives" (ibid. 22). While factors such as race, gender, and lived experiences count as predispositions, the concept is best exemplified in Zaller's view by *political values*, the strongest and most relevant predisposition with regard to effect on mass opinions (ibid. 22). To Zaller, predispositions are simply an exogenous variable, to be used as necessary but whose origin and theory are outside of his research (ibid. 23).

Then, Zaller proceeds to address the potential sources for error in public opinion polling, with a thorough

literature review of his own. Attempting to collect such disparate ideas as response effects, question-order effects, and other sources of opinion variance under one umbrella term, Zaller defines *measurement error* as the "fluctuations that appear in people's overt opinion statements" (ibid. 31). Noting that it constitutes a significant portion of the variance of opinion items, Zaller declares measurement error worthy of exploration. He then puts forward the meaningful claim that, if polls simply reveal a respondent's "true attitude", then simple factors like the order of questions or other "wholly nonsubstantive and trivial alterations" (ibid. 32) should have no effect. He goes further, though, and predicated on that same assumption, notes that the fact that "changes in the substantive order of questions [. . .] produce much larger effects on political opinions [. . .] reliably [. . .] indicates that many respondents are making up their opinions – or at least editing and modifying them – as they go through the questionnaire" (ibid. 33). Zaller then persuasively notes that this fact "seriously undermine[s] the conventional view that surveys are passive measures of 'what the public really believes'" (35). Hence, he writes that researchers have begun to focus less on the idea that surveys simply reveal fixed opinions, and "have begun to concentrate instead on the 'question-answering process' by which individuals *construct* opinion reports in response to the particular stimulus that confronts them" (ibid).

However, Zaller cautions that "most research on the new 'question-answering model' has tended to focus on response effects, and has had nothing to say about either random response instability or the larger process by which people form their opinions in response to information gleaned from the political environment" (ibid). As a result, Zaller then outlines his attempt to answer these questions with a model of his own, which he describes as follows:

> People are continuously exposed to a stream of political news and information, much of it valenced so as to push public opinion in one direction or the other. But, owing to the generally low levels of attention to politics in this country, most people on most issues are relatively uncritical about the ideas they internalize. In consequence, they fill up their minds with large stores of only partially consistent ideas, arguments, and considerations. When asked a survey question, they call to mind as many of these ideas as are accessible in memory and use them to make choices among the options offered to them. But they make these choices in great haste – typically on

the basis of the one or perhaps two considerations that happen to be at the "top of the head" at

the moment of response (ibid. 36).

This statement begins with Zaller's claim about exposure to *political* news and information. This is a relatively uncontroversial claim; for many potential reasons that are outside the scope of this thesis, people are exposed to a significant amount of news at an ever-increasing rate (Iyengar 2022, 118), and the much-discussed politicization of content has led news and information to also be politicized. Asking the question, as the authors of *The American Voter* do, of "when is a specified condition political, and when is it not," is also outside the scope of this thesis; however, for these purposes, it suffices to say those conditions are dependent on variables at both the individual and societal level (Campbell et al. 1960, 29).

Of more interest is Zaller's follow-up, a shift from the classical ideal of the "rational citizen". Even the authors of *The American Voter* write that "we may assume that the individual strives to give order and coherence to" internal stores of opinions (ibid. 59). Zaller, in contrast, deviates from this significantly, assuming that individuals can hold incoherent and contrasting opinions, due to some combination of low information or a lack of critical thinking. Finally, Zaller describes the process by which individuals create a survey response, a hasty sample of many considerations, one which is heavily implied to be created with great uncertainty and perhaps inaccuracy as well.

The model is further broken down through a series of four axiomatic statements, which describe the four steps of his Receive-Accept-Sample (RAS) model. Zaller begins with one more crucial definition, a *consideration*. Considerations are the fundamental data point by which Zaller's statements are turned into quantifiable data, and will be crucial for understanding the operationalization of his model. Zaller defines a consideration as "any reason that might induce an individual to decide a political issue one way or another [. . .] a combination of cognition and affect – that is, a belief concerning an object and an evaluation of the belief" (Zaller 1992, 40). Notably, considerations are not necessarily defined as a *rational* reason; as a potential example, Zaller offers up a theoretical individual who reacts with anger upon seeing an unhoused person, which leads them to construct an opinion which opposes government spending on homelessness.

With that final definition set out, Zaller then moves to his axioms. The **Reception Axiom** (A1), is the claim that

"the greater a person's level of cognitive engagement with an issue, the more likely he or she is to be exposed to and comprehend – in a word, to receive – political messages concerning that issue" (ibid. 42).

The idea of reception, by this axiom, is a two-step process in and of itself: exposure and comprehension. Exposure to political messages comes in many fashions, from elite discourse to media exposure to simple conversations (ibid. 43). However, comprehension is a more complex issue. For an individual to *comprehend* a political message on an issue, they must have internalized that message as political due to reception of information framing that issue as political. Again, the psychological factors which analyze how those frames are internalized are beyond the scope of this thesis, but it is worth noting that the process of exposure and comprehension is a thorough one in and of itself. To measure the likely reception of political information on issues, and thus cognitive engagement with those issues, Zaller uses general measures of political awareness, neutral and factual tests of public affairs knowledge like the number of Supreme Court justices. This is, as Zaller admits, "less than ideal" compared to domain-specific measures of political awareness (ibid), though research that was current at the time of *Mass Opinion* validates this claim[1]. Zaller then continues with his **Acceptance Axiom**, A2, as follows:

People tend to resist [acceptance of] arguments that are inconsistent with their political predispositions, but they do so only to the extent that they possess the contextual information necessary to perceive a relationship between the message and their predispositions (ibid. 44).

The acceptance axiom is crucially conditional upon contextual information that ties together arguments and political predispositions. Zaller claims that context is carried within *cuing messages*, claims about the ideological or partisan implications of *persuasive messages.* For example, a conservative citizen may support a persuasive message about increased government funding for defense, but if they are given a cuing message that the funding is from a Democratic House, they may be less likely to accept that argument, as they have been shown that it is incompatible with their predispositions. This creates a model of a relatively "mechanical" citizen, who reacts to political ideas "on the basis of external cues about their partisan implications, and if they are too poorly informed to be aware of these cues, they tend to [be more likely to] uncritically

---

[1]See Zaller 1992, 43, and Zaller 1992, 333-337.

accept whatever ideas they encounter" (ibid. 45). Zaller's phrasing in this sentence is relatively pessimistic, presenting people as uncritical thinkers, but the deeper meaning perhaps has better normative implications.

The first two axioms describe the process by which individuals collect considerations in their heads, and hence are grounded much more in the broader research schema of quantitative political behavior. As Bartels writes, "Zaller [...] appeal[ed] to the Converse-McGuire two-step model of exposure (in Zaller's version, 'reception') and acceptance of political information" (Bartels 2012, 6). Where Zaller begins his departure from previously conventional models are his third and fourth axioms, where he describes the sampling portion of the RAS model. A3, the **Accessibility Axiom**, claims that:

> The more recently a consideration has been called to mind or thought about, the less time it
>
> takes to retrieve that consideration or related considerations from memory and bring them to
>
> the top of the head for use (Zaller 1992, 48).

The Accessibility Axiom, in Zaller's claim, is "one of the best-established empirical regularities in cognitive psychology [...] support for the basic idea is overwhelming, and as far as I can tell, undisputed" (ibid.). Aaron Strauss, to contextualize the idea of the axiom, uses a first-in-first-out (FIFO) queue, to describe the axiom; he writes "the first political consideration heard (if never thought of again) works its way down to the end of the queue (i.e., human memory) until it is completely forgotten (or at least, inaccessible). Considerations already in memory that are primed or re-accepted move to the front of the queue and become more accessible" (Strauss 2009, 13). Contemporary research (e.g. Druckman et al. 2012) also validates this, showing that recently acquired considerations impact reported opinions. Finally, Zaller concludes with his description of A4, the **Response Axiom**:

> Individuals answer survey questions by averaging across the considerations that are immediately
>
> salient or accessible to them (Zaller 1992, 49).

The Response Axiom is the simplest of the four axioms, even in Zaller's admission; he writes that "many readers will suspect that the top-of-the-head response axiom is too simple – as, indeed, it surely is" (ibid.) However, the flexibility by which the axiom allows for different considerations to come into play with regard to different questions makes it a powerful statement, and it is easily quantifiable. Zaller, by using averages of

accessible considerations on a subject, chooses to approach them as either "positive" or "negative". Hence, if all considerations are equally likely to be sampled, then the probability of a liberal response is simply $\frac{L}{L+C}$, where L represents the "liberal" considerations and C represents the "conservative" considerations.

After outlining his model, Zaller spends several chapters exploring the impact of his model and creating testable deductions on several salient topics, focusing firstly on an explanation for response instability and then analyzing question-order effects and generalized variation in responses in chapters 4 and 5. Zaller then proceeds to the main portion of *Mass Opinion*'s argument, where he analyzes the influence of elite communications (in the RAS model, the source of messages) on public opinion in situations where political elites are either unified in their messaging (where he uses the early stages of the Vietnam War as a case study) or polarized (analyzed through the case of the Gulf War) in chapter 6. Afterwards, he delves more deeply into what exactly defines attitude change under the RAS model, in chapter 7 and the ways in which public opinion shifts due to individual-level changes, whether through a shift in the balance of considerations in the current information environment or due to newly salient considerations in the environment.

He then specifies specific statistical tests of reception, acceptance, and attitude change, before examining message-level determinants of attitude change, which are defined as the *intensity* of a message (as created through the media or elite messaging) and the *familiarity* of a message (the relative number of considerations on an issue already present in the public). Zaller then takes his specifications and examines them through the lens of several tests, from the public opinion shifts during the Vietnam War to Reagan's popularity during Iran-Contra in chapters 8 and 9. Along the way, he forms hypotheses about how opinions change differently in different segments of the population, owing to different levels and types of resistance to new messages among people with differing levels of political awareness. Importantly, though his central claim revolves around the idea that it is elite discourse that shapes mass opinion and not the other way around, Zaller also considers the argument that mass opinion shifts elite discourse and unpacks his assumption and its flaws in specific instances in chapter 11. In that chapter, Zaller also critically reviews his basic axioms, which is hugely informational to my redefinition of his model in the following chapter. These tests, models, and reviews are wide-ranging and comprehensive in their evaluations, deductions, and specifications, and will be outlined in Chapter 4 of this thesis.

2.3 The Psychological Grounding of the RAS Model

I will not delve deeply into more details of *Mass Opinion* until Chapter 4, but at this stage it is worth taking the time to contextualize the psychological grounding of the RAS model. Importantly, unpacking these debates allows for a full investigation of the work of the few authors who critique or expand on Zaller, and completes the summary of the theory behind the RAS model. By painting in broad brushstrokes, Zaller seems to come into conflict with the consensus of political psychologists along two primary dimensions, both of which have been thoroughly researched. The first question is about whether a memory-based model or an online model is a better choice, and is addressed by Zaller in *Mass Opinion*. The second question, about the basic approach that humans use to acquire information, is not explicitly addressed by Zaller, due to the fact that at the time of *Mass Opinion*'s writing, the debate was not fully fleshed out. However, exploring the sides of this debate (the Bayesians on one hand and the motivated reasoners on the other) can allow for a more nuanced understanding of Zaller's work and provide a crucial understanding of its place in the literature along with a framework to interpret the work of the critical authors.

2.3.1 Online Vs. Memory-Based Models

Beginning with the first question (online versus memory-based), Zaller spends a significant amount of time declaring his model as a memory-based model, where individuals are described as constructing an attitude by drawing specific information (i.e. the aforementioned considerations) from long-term memory when they are asked a question (Kim and Garrett 2011, 1). The idea of a memory-based model is contrasted with an online model, where attitudes are formed in real time, at the moment of information exposure, and are thus simply recalled when asked a question (ibid.). However, this memory-based model is far from widely accepted. Zaller admits that his "top-of-the-head response model is [...] openly at odds with a considerable research literature" that suggests "people's judgments are normally made 'on-line' at the point of initial processing of incoming information" (Zaller 1992, 278). Druckman and Chong (2010) describe the online model as claiming that, after forming an attitude, "individuals then store the summary evaluation in memory, possibly forgetting the original considerations that contributed to the" attitude (Druckman and Chong 2010, 666). However, Zaller argues that the online model is less plausible in political circumstances, writing that

"the strongest evidence that the on-line model is inappropriate in the domain of political attitudes is that people's attitude reports exhibit so much *purely chance* variation over time and are systematically affected by things, such as question order, that ought, by the logic of the on-line model, to be irrelevant" (Zaller 1992, 279).

Despite Zaller's claim that the online model is less plausible in political circumstances, this is not something that is widely accepted by the political science and political psychology communities. In fact, it is at this most basic of levels that Zaller's model conflicts with perhaps the other most famous model that attempt to paint a picture of the mental processes that undergird the development of political opinion: Milton Lodge and Charles Taber's *John Q. Public* model, which, as outlined in their book *The Rationalizing Voter* in 2006 and expanded upon significantly since then, utilizes an online formulation to describe how people form attitudes. This is not the only way in which Zaller comes into conflict with Lodge and Taber, though.

2.3.2 Bayesian Reasoning Vs. Motivated Reasoning: What's The Difference?

At the bottom of *John Q. Public* lies a simple argument: "individuals do not accept and internalize informational and contextual frames irrespective of their predispositions [...] individuals also engage in *motivated reasoning* [emphasis added] consistent with their prior attitudes" (Kraft et al. 2015, 124). Lodge and Taber's introduction of the term to the political science community set off a storm of theorizing. At its most basic form, motivated reasoning is "a description of a process by which individuals acquire, evaluate, and form related judgments about new information" (Bolsen and Palm 2019, 2), a process in which different goals or motives can affect an individual's cognitive processes and the mechanisms by which they reach a conclusion (Kunda 1990, 480). This, as Kunda writes, stems from well-founded theory and empirical regularities in psychology: "under the current state of knowledge, the motivational account appears to be [...] parsimonious and coherent" (ibid. 493). This widespread acceptance has translated itself into the political science community, as shown in Taber and Lodge's model. Alexander Coppock (2022) expands on this concept in his book *Persuasion in Parallel*, where he provides a meta-review of the basic methods of how people change their minds, including a discussion of motivated reasoning. Coppock notes that the two types of motivated reasoning are *accuracy motivations* (which compel people to seek a factual or "correct" conclusion) and *direc-*

tional motivations, which lead individuals to seek to reach a "congenial conclusion", where they believe what they want to be true, regardless of the facts of the matter. (Coppock 2022, 129-130). Coppock continues, writing that "the directional motivation" –in Zaller's case, effectively one's predisposition– "compels people to believe what they want to be true, regardless of the facts of the matter" (ibid.). While it might seem that accuracy motivations seek objectivity, this is not necessarily the case with regard to political attitudes. As Coppock pointedly notes, "holding a *correct* [emphasis added] attitude would mean evaluating better policies more positively than worse policies"; notably, *better* in this case is subject to the individual's predispositions (ibid.). In terms of the RAS model, the theory of motivated reasoning is clearly supported even if it is not mentioned by name: by simply evaluating the four axioms, clearly, an individuals' conclusions (i.e. their opinions) are biased by their predispositions (Strauss 2008, 16).

The other primary mechanism by which people are purported to generate belief systems is through Bayesian reasoning. In a Bayesian framework, there are three main factors of interest: an individual's *prior*, effectively their political opinion (equivalently, in Zaller's terms, the citizen's set of considerations before encountering a specific message); the *likelihood*, which describes the probability of encountering the data (for Zaller, the two steps of reception and acceptance), and the *posterior*, which is the subject's political opinion after encountering the data. This may seem relatively abstruse, so let us evaluate one definition of Bayesian processing and evaluate it as Zaller might. Coppock writes that "Bayesian theories of information processing propose that people interpret evidence according to a likelihood function" (Coppock 2022, 56). In Zaller's method, evidence can easily be understood as a message, and "interpret [...] according to a likelihood function" clearly is the process of receiving and accepting a message. Coppock then writes that "the resulting likelihood is combined with a prior attitude", which is easily construed as a citizen's predisposition, "to generate a posterior attitude", which similarly is the set of considerations held in a person's mind after accepting a message (ibid.). Individuals then update their prior beliefs, $\pi(A)$, using their likelihood function, $\pi(B)$, to construct their posterior $\pi(A|B)$ using Bayes' Rule[2].

Bayesian reasoning, as Coppock continues, "has garnered an undeserved reputation as being 'rational' or 'reasonable', because it imagines that individuals coolly and calmly update their views in line with a

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[2]As formally defined utilizing the three normal axioms of a probability, Bayes' Rule states that, for any two events A and B, that $\pi(A|B) = \frac{\pi(B|A) \cdot \pi(A)}{\pi(B)}$ where $\pi(A|B)$ denotes the probability of event A conditional upon event B, and $\pi(A)$ is the probability of event A.

clean mathematical formula" (ibid. 131). However, individuals may have strange prior beliefs or likelihood functions. As an example, consider an individual who is a climate change skeptic, and thus has a strong prior belief that climate change is fake. This is $\pi(A)$. That individual then encounters a report that says climate change is real; this is $\pi(B)$. To figure out $\pi(A|B)$, we need to evaluate the likelihood function $\pi(B|A)$; that is; we seek the individual's belief that the report would be generated if climate change is false. This is something that can vary widely, and so it is impossible to say that the individual in question would update their views in the direction of the report. There is also a significant body of research that shows that people do use Bayesian reasoning as a heuristic outside of political science when making decisions (see El-Gamal and Grether 1995, for example). Furthermore, in the field of political opinions, Hill (2017) shows that subjects update their beliefs in a "cautious Bayesian" framework, where their prior beliefs influence more of their posterior beliefs than a perfect application of Bayes' theorem would expect (Hill 2017, 1412).

2.3.3 Do The Specifics of Information Processing Matter?

We have just seen that Zaller's RAS model can be understood both in a context of Bayesian reasoning and with the motivated reasoning framework. Furthermore, we have seen that there is disagreement between Zaller and other well-regarded authors about the very axioms that undergird their models. This leads to a natural question: is there conflict between the frameworks of information processing (motivated reasoning and Bayesian reasoning) or between the models of attitude construction (online and memory-based)?

In short, the answer is no. Beginning with information processing, the fact that both Bayesian reasoning and motivated reasoning can generate the same results might seem contradictory, but the RAS model is not a special case; the question of which theory can create biasing tendencies has been proven to be indeterminate. Coppock cites a copious body of research to show that accounts of motivated reasoning are undergirded by three main biases through which motivated reasoning impacts opinions–yet, at the same time, he crucially cites Kunda (1990), who shows that each of these three significant biasing tendencies can be generated from either a Bayesian framework *or* a motivated reasoning framework. The three cognitive tendencies– biased assimilation of new information (i.e. the effect of preexisting beliefs), disconfirmation bias (peoples' tendency to argue against counter-attitudinal information), and confirmation bias (preferential seeking of

information that confirms preexisting beliefs)–can be generated from both frameworks. Hence, observing biased assimilation of new information, disconfirmation bias, and confirmation bias does not necessarily provide evidence of one framework over the other, since the effects seen from these biases can be generated through either process. This is expanded upon by Little (2022), who identifies two models of motivated reasoning. In the first model, what he terms once-motivated reasoning, the author mathematically defines both an accuracy motive and a directional motive, and through a series of mathematical proofs shows that any motivated reasoner has a fully Bayesian equivalent; that is, it is *impossible* to mathematically differentiate between a theoretical subject who is influenced by directional motives and a theoretical subject who is not at all (Little 2022, 10-11).

With regard to the RAS model specifically, this lack of clarity is evident. Zaller appears to simultaneously endorse both a Bayesian process and one that suggests motivated reasoning. He begins his second chapter by proclaiming that "every opinion is a marriage of information and predisposition," which could hardly be a more enthusiastic endorsement of the Bayesian updating process (Zaller 1992, 6). Alternatively, as was mentioned, the four axioms of the RAS model clearly show that predispositions undergird the process of information processing, suggesting the value of motivated reasoning as well. While this indeterminacy may seem like a frustrating result, it is in fact incredibly useful; as Little writes, "any pattern of updating consistent with Bayes' rule is also consistent with once-motivated reasoning" (ibid. 12).

Moving back to an analysis of attitude construction, Bolsen and Palm (2019) cite a bevy of sources and conclude that, across several experiments, "online processing is not a necessary condition for directional motivated reasoning" (Bolsen and Palm 2019, 14). Thus, importantly, Zaller's model, despite its use of a memory-based model over an online one, does not oppose the model of motivated reasoning in which it appears to sit. This indeterminacy in terms of the online versus memory-based processes that underlie motivated reasoning and a Bayesian updating process is critical, as it shows that Zaller's model, despite its conflicts with other portions of the literature, cannot be dismissed out of hand, as long as it provides evidence of the three major biases cited by Kunda–which, as shown above, it does. In Chapter 3, when I propose a way to build on Zaller's model, I will take advantage of this indeterminacy.

2.4 Building on the RAS Model

Considering the titanic role of *Mass Opinion* in shaping discourse in political science, Zaller's RAS model itself has received comparatively little deep scrutiny. Despite the thousands of papers listed in Google Scholar that cite *Mass Opinion*, and the glorification of the work by famed political scientists such as Larry Bartels and Philip Converse, much of the focus of the past thirty years of scholarly literature that has utilized *Mass Opinion* does not focus on Zaller's modeling, and only refers to him in passing. The previous subsection focused on a discussion of motivated reasoning and Bayesian reasoning in general; notably, while Coppock and Little both cite Zaller as an example of a work that can be understood with both motivated reasoning and Bayesian reasoning, neither of them attempt to thoroughly engage with or critique the model. A small sample of the top works in Google Scholar that cite *Mass Opinion* turns up articles that explore the psychology of fake news[3], attempts to understand partisanship and policy attitudes in the context of COVID-19[4], and the politics of racial resentment in Wisconsin's 2016 gubernatorial race[5]. Each of these articles makes a useful contribution to the growing body of work in political science, but none of them reference Zaller more than once, and often his work is reduced to a one-line reference for his conclusions, that elite discourse shapes mass opinion, that people filter information through their predispositions, or that peoples' political awareness impacts their opinions. This is not limited to Google Scholar. In a similar literature review conducted by Dobrzynska and Blais in 2008, the authors find that of the 10 most relevant papers (in terms of importance accorded to *Mass Opinion*) published in the American Political Science Review, only one systematically tests the RAS model; two others lightly examine it; the other seven only refer in passing to his theoretical assumptions or empirical findings when elaborating their own arguments (Dobrzynska and Blais 2008, 261).

However, even among the papers that focus on the technical and minute details of the RAS model, few of them utilize a deep and comprehensive analysis of the model. Dobrzynska and Blais, in one of the few studies that does thoroughly interrogate the RAS model, conducted a thorough literature review of their own on the subject in 2008, and found that "very few studies have set up as their primary goal to test the reception and acceptance model and the few that do are, for the most part, static analyses that attempt

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[3]Pennycook and Rand 2021
[4]Gadarian et al. 2021
[5]Cramer 2016

to apply a dynamic model of opinion formulation" (ibid.). That is, the authors note that despite the fact that Zaller's model focuses heavily on the analysis of attitude change over time, the primary focus of the studies they cite is not a time-dependent analysis and hence not the most accurate test of the RAS model. Further, much of the research that does focus on Zaller utilizes his claim that mass opinion is shaped by elite discourse (Bartels 2012, 9). This is a proposition that follows from the model, and is a conclusion rather than an actual focus of analysis; as Zaller writes, his book is "an extended argument" (Zaller 1992, 1) on the formation of opinion, and incorporates so much more than this principal focus. As Larry Bartels elaborates, is that "what is most striking about this principal emphasis in the literature is how little it has to do with the evidence actually presented in Zaller's book" (ibid. 10).

However, there is still a small but significant body of work from the past 30 years that analyzes the RAS model specifically, from Zaller himself to significant critics of his work. The vast majority of this work comes in small doses, wherein researchers analyze a finding through the lens of the RAS model or expand on it slightly, using Zaller's methodological approach and adapting it to slightly different fields. For example, working to discover the role of two-sided information flows in the 1992 Presidential election, Dalton et al. (1992) find support for the reception axiom, showing that individuals who reported lower attention to the campaign had less accurate perceptions of the evaluative content of newspapers (Dalton et al. 1992, 121). This follows from Zaller's model, where individuals with lower political awareness would be understood to have both received fewer messages from newspapers and to have less accurate perceptions of that content. Matland and Murray (2012) take the RAS model and translate it to evaluate voter turnout, where the Response Axiom is reparametrized to understand a "response" as a voting or non-vote, and they find results that seem to confirm the validity of their model, finding that the impact of awareness on the probability of voting is highest among the moderately politically aware and lower among the most and least aware. These curvilinear effects are similar to those expected by Zaller's model (Matland and Murray 2012). Other work, like that of Sciarini and Kriesi, takes a more psychological focus, exploring how utilizing "crystallized," or better-formed opinions, in the RAS model can improve its explanatory power (Sciarini and Kriesti 2003). While most of these papers mentioned build on the RAS model specifically and do hone their Zallerian focus on the modeling process itself, there are three papers worth a deeper dive that either critique or build on

the model itself. I will next discuss those.

The first paper, written by Dobrzynska and Blais in 2008, is a lightly cited (13 citations in ProQuest) paper whose primary attempt is to test the reception and acceptance model. Dobrzynska and Blais write that the work above by Dalton et al. is the only one prior to their research that claims to have found support for the reception and acceptance axiom, and then proceed to write that Dalton et al. did not actually find the support for the reception axiom claimed above, instead finding a more limited, nonlinear effect of political attention at the acceptance stage only for the least attentive (Dobrzynska and Blais 2008, 261). They claim that, in Zaller's model, those with higher political attention (and hence, higher political awareness) would better be able to predict the evaluative content of newspapers.

After a thorough literature review of their own that notes that all other preceding work has focused on static analyses of opinion rather than a dynamic analysis, Dobrzynska and Blais explore change of opinion over time and conduct what they claim to be the first dynamic, sequential test of the effect of predispositions and awareness on the reception and acceptance of political messages since Zaller himself. They begin by identifying the 1988 Canadian election as a good candidate for analysis, relying on the fact that it was largely contested over one singular issue (a free trade agreement), having robust data available from the Canadian Election Study, and allowing easy tests of the model. The researchers then specify four hypotheses that intrinsically link factual political awareness (as specified above by Zaller) with the reception and acceptance of messages both using the traditional static and a novel dynamic approach. Framing the RAS model as a test of how attitudes change over time, Dobrzynska and Blais's *dynamic approach* proposes an interaction between relevant independent variables and whether they were captured at the beginning or end of the campaign. In contrast, the static approach does not incorporate the time-variant effect and instead focuses on whether one received or accepted any messages at all through the campaign.

In multiple instances, the researchers find that the dynamic RAS model of opinion change throughout the campaign is not supported. They write that "the most aware were more likely to receive party messages but they were not more likely to learn more during the course of the campaign. And, most importantly, the highly aware were not more prone to form their opinion on the basis of their predispositions" (ibid. 271). The authors clearly are in favor of Zaller's work, noting that their results support the Reception Axiom, but

not the formation of opinion, and they claim that the combination of findings is inconsistent with the model; they do acknowledge that one singular case should not dismiss the model, especially in the absence of other work that attempts to empirically verify the model or that provides a viable alternative (ibid. 272).

Dobrzynska and Blais' analysis is theoretically sound and brings up important issues, and their concerns with the model should not be dismissed. However, there are several areas of their analysis that are worthy of interrogation in their own right. Firstly, in response to their critique of of Dalton, they (Dalton et al.) do not find that the effects for those with higher attention are lower; they simply find a lack of statistical significance. As a result, the limited support seen by Dalton et al. cannot be fully discarded; the effect of party identification (as a proxy for predisposition) on the evaluative content of newspapers moves from -.26 among the least attentive, to -.13 among those with "some" attention, to -.06 to those with the highest attention, implying that there is a possibility of strong support for the axiom rather than a takeaway that is limited by a singular *p*-value. As a result, it is not necessarily the case that the only other dynamic test of the model can be dismissed out of hand.

Further, the dataset utilized by Dobrzynska and Blais is limited to 47 days of the campaign, and operationalizes the dynamic aspect of the campaign (i.e. the "start" versus the "middle" and the end) as such. This would be equivalent to, in an American Presidential election, beginning the data collection in the middle of September, which could not possibly capture a proper dataset for a time-series analysis of opinion change. Consider this in contrast to Zaller, who analyzes attitude change in the 1984 Democratic primary with over five months of data (Zaller 1992, 254). While this may be a function of a lack of available data in the 1988 Canadian Election Study, it still casts some potential shadow on the researchers' results, which can be easily remedied by means of a more thorough and long-term dataset. As a result, while the critique offered by Dobrzynska and Blais is theoretically important and their analysis is sound, their conclusions have some fundamental flaws that are easily remedied.

The second paper, by Smets and Isernia, is also lightly cited; the authors do not challenge Zaller's model itself; rather, they instead evaluate its explanatory power in direct comparison to similar models of attitude change. The paper empirically evaluates three theoretical mechanisms of attitude change by directly comparing the "heuristic" (meaning awareness-based) RAS model against a "systematic" of attitude

change, wherein predispositions are more important than awareness in determining attitude change, as well as the authors' own novel "deliberative" model, which claims that knowledge gained during the poll itself and arguments that respondents are exposed to is the crucial component (Smets and Isernia 2014, 395). The authors, utilizing data collected in four stages over the course of the 2-year EuroPolis poll, estimate several models that incorporate the dynamic (time-variant) effects of awareness, political predispositions, and internal deliberation. They also, similar to Dobrzynska and Blais, create separate models for the generalized ideas of "reception" and "acceptance". Smets and Isernia show that political awareness is correlated with attitude change (ibid. 400) though its effect is secondary to predispositions, a result which favors the systemic model of attitude change. Importantly, the authors operationalize awareness as education level, which is decidedly not in the spirit of Zaller's model (ibid. 396).

There is certainly empirical validation for Smets and Isernia's claim that those with higher education are more tuned in to politics, but from a modeling perspective, this is not a true test of what Zaller claims in the RAS model; educational level is objectively not a measurement of political awareness. Hence, while Smets and Isernia's conclusion that predispositions are the primary influence on what drives attitude change is certainly a valuable insight that adds on to the scientific literature and their approach is theoretically promising, there is certainly work that can be done in order to expand upon their research and test these models directly against each other.

Interestingly, the authors come into conflict with Dobrzynska and Blais on the influence and role of predispositions. Smets and Isernia note that predispositions are not a factor in the reception stage of Zaller's model, as Dobrzynska and Blais do (ibid. 405). Further, they agree with Dobrzynska and Blais that predispositions were a factor in acceptance of messages regardless of their "awareness" (ibid. 400), though this conclusion is problematic for the aforementioned reasons. But, the authors paraphrase Sniderman et al. (2001) and construct a theoretical argument for the influence of predispositions on receptions, and crucially, find empirical support for this finding. This conclusion is validated by Iyengar (2022), among others, who write that "both [search engines and social media] feature personalized algorithms that make it more likely that individuals encounter information consistent with their political loyalties" (Iyengar 2022, 134). This speaks to a broader change in individual engagement with the political environment as a whole in the past

thirty years. No longer is it the case that, as Zaller writes, "most people [...] are simply not so rigid in their information-seeking behavior that they will expose themselves only to ideas that they find cogenial" (Zaller 192, 139).

The word *only* performs a lot of theoretical work in that sentence, as it is obvious that no individual will solely encounter ideas they entirely agree with. However, Iyengar summarizes decades of research after the release of *Mass Opinion* and finds that "the evidence suggests that exposure to political information is determined by multiple factors [including] the desire to keep up with politics generally and to acquire information that is consistent with existing political preferences" (Iyengar 2022, 136). Zaller's model, which assumes a lack of selective exposure, may have been more accurate in the early 1990s; he cites a copious body of work from the 1970s and 1980s to source this claim. But it is clearly the case that, in an era of tailored recommendation and search algorithms, citizens of the 2020s live in a new information environment, and that people's predispositions do influence the information they seek out. Considering this bevy of evidence, a reevaluation of the selective reception hypothesis presents perhaps the first clear and crucial point for improvement on Zaller's work. Furthermore, Smets and Isernia's work is perhaps the first significant contribution to a contextual evaluation of the RAS model (that is, by directly comparing it to other models of political opinions), and as such, its conclusions are incredibly important to understanding the underpinnings of how citizens construct and change their political attitudes.

The final paper worth examining in detail is a dissertation by Strauss that attempts to build on the RAS model to construct what he terms the "personal experience model", which evaluates the specific role of "personal experiences" in creating considerations and overriding preexisting predispositions (Strauss 2009, 18). To Strauss, the difference between a personal experience and a predisposition is that a *personal experience* is an external interaction with a relevant issue (e.g. having to deal with a costly insurance bill, poor interactions with a police officer, etc) which are different from internal predispositions. Strauss' contribution to the literature is different than the preceding authors in that he does not attempt to evaluate Zaller's model, nor analyze it from a theoretical perspective; rather, he takes it for granted and builds on it theoretically, re-conceptualizing the way in which citizens actually store and access their relevant considerations. Strauss takes a statistical approach to this, beginning by assuming that individuals first have some prior *distribution*

of considerations. This breaks from Zaller, who conceptualizes considerations as a binary, either positive or negative (Zaller 1992, 45). Strauss then assumes that a politician presents a certain position with some degree of "persuadability"; a citizen then, given their prior distribution, *updates* their series of beliefs by adding the position to their store of considerations. Then, as Strauss writes, "Zaller's 'sample' step implies that reported political judgements are draws from random variables" (Strauss 2009, 16). Crucially, despite the usage of the word "update", Strauss stresses that Zaller's model is clear that individuals do not act in a Bayesian fashion; that is, rather than "report[ing] a summary statistic of their beliefs when queried on a survey," Strauss writes that, in Zaller's model, people "draw from top-of-the-head considerations and [thus] are not perfect Bayesians" (ibid. 16-17). Hence, Strauss views the theoretical integration of new considerations after their acceptance as a classical mixture, rather than a Bayesian update.

To understand how this mixture is represented in terms of Zaller's framework, Strauss presents an example where a voter has a Gaussian prior distribution (i.e. a normal distribution) of considerations and encounters a message from a politician, also a Gaussian distribution, where the variance in the second distribution represents the "persuadability" of that message. Hence, the resulting distribution is a Gaussian Mixture Model, with parameters given by the prior distribution and the encountered message. As individuals accept more and more messages, their distribution becomes an infinitely additive mixture. When individuals sample from their considerations after encountering new messages, the expected response is no longer the $\frac{L}{L+C}$ claimed by Zaller, but rather the expected value of their new Gaussian distribution of considerations, a much more complicated formula. Strauss' framework is critical in expanding Zaller's conceptualization of the Response Axiom to a continuous distribution of considerations, rather than a binary discrete distribution. While given Zaller's framework, considerations can be implicitly understood as a draw from a Bernoulli random variable, by explicitly describing considerations as a generalized random variable drawn from some continuous distribution, Strauss grounds Zaller's model in the field of statistics and probability and expands the possibilities for theoretical analysis beyond just political science, showing that formal statistical analysis *can* play a role in updating and evaluating Zaller's model.

The probabilistic specifics aside, to Strauss, this mixture can only arise through the usage of motivated reasoning, where "individuals' conclusions are biased by their preconceptions" (ibid.). But, as discussed,

whether the RAS model utilizes motivated reasoning or a Bayesian framework is an open question, and decidedly nowhere near the black-and-white picture that Strauss presents. While in the complex domain of information processing and updating, it is impossible to generalize to any extent from a singular study or author, this cuts both ways. Strauss cites exactly one source to prove his claim that people do not act in a Bayesian fashion, a psychology experiment from 1951. In addition to the theoretical indeterminacy, Zaller explicitly writes in his introduction that "every opinion is a marriage of information and disposition," which could hardly be a more explicit endorsement of the theoretical Bayesian updating process as a whole (Zaller 1992, 6, quoted in Hill 2017, 1405). As discussed above in Coppock (2022) and Little (2022), the twin processes of Bayesian updating and motivated reasoning are somewhere in between indistinguishable and indeterminate. Even further, as mentioned, Strauss himself uses Bayes' Theorem when calculating the mean of his posterior distribution (i.e. the O_{ji} model above), though he notes that this is for convenience alone (Strauss 2008, 17). Whatever theoretical mechanism drives the RAS model, it is clear that the indeterminacy between motivated reasoning and Bayesian reasoning has evaded a clear understanding in the literature around Zaller as well.

Shockingly enough, Smets and Isernia, Dobrzynska and Blais, and Strauss represent the only three major works of the past thirty years that critically evaluate Zaller's model and that provide a useful framework to continue their work. As a result of their analyses, there are several takeaways from this literature review. First and foremost, it is clear that regardless of its widespread acceptance in the political science community, Zaller's model itself is worthy of a reevaluation and perhaps an updating, as the few works that interrogate his work thoroughly are inconclusive at best. This does not require that the entire model itself be thrown away and discarded, and his theoretical framework is clearly incredibly useful. However, models are always worthy of improvement, and the analysis in the currently existing literature, while flawed, shows that there is certainly room to expand upon Zaller's work and critique it from an empirical and theoretical perspective. Secondly, the critical authors (Dobryznska and Blais, along with Smets and Isernia) have provided significant critiques of Zaller's work at the reception and acceptance stages, but the critical literature has ignored the sample stage of his model and on the fourth axiom, which was Strauss' main focus of interest. Furthermore, the critical authors have, for previously identified reasons, flaws in their modeling process that are easily

fixed. In a world where exabytes of data are generated every day, there are copious data sources that measure the dynamic change of opinions over long periods of time (more than the 47 days used by Dobryznska and Blais), and data that, unlike Smets and Isernia, includes ways to test Zaller's model in a manner consistent with its specification. As a result, this thesis has ample grounding in a relevant and growing theory of quantitative political behavior, yet builds on preexisting research to explore new theoretical domains.

3   Creating A New RAS Model

"Truth is ever to be found in the simplicity, and not in the multiplicity and confusion of things." -Isaac Newton

To begin the outline of a proposed new model, let's begin from the very beginning, following Zaller to set up a series of first-principles and definition. First, I will start with the concept of messages. Define a *message* M created on issue i at a time t that we shall call M_{it}. As per Zaller, say that M_{it} contains within it two pieces of information: its position M_p and its cue M_c. We can then vary slightly from Strauss's definition of a message as a normal distribution (see above) and consider M_{it} as a Beta distribution $M_{it} = Beta(\alpha, \beta)$. A Beta distribution is useful for many reasons, some of which will reveal themselves; for the moment, the utility of a Beta distribution comes in the fact that it is continuously defined on the unit interval $(0, 1)$, which allows us to consider our messages as falling on a continuous scale, as Strauss does.

Knowing that the mean of a Beta distribution is given by $\frac{\alpha}{\alpha+\beta}$ and that its variance is given by $\frac{\alpha \cdot \beta}{(\alpha+\beta)^2 \cdot (\alpha+\beta+1)}$ (again, defined above as M_c), we can then utilize those equations to solve for α and β to reparameterize our Beta distribution in terms of its mean and variance. In doing this, we can consider our message as having mean M_p and variance M_c, implying that the message's position is M_p and its persuadability is M_c. The reparameterized distribution is defined as[6]

$$M_{it} = Beta\left(\left(\frac{1 - M_p}{M_c^2} - \frac{1}{M_p}\right) \cdot M_p^2, \ \left(\frac{(1 - M_p)}{M_c^2} - \frac{1}{M_p}\right) \cdot M_p^2 \cdot \left(\frac{1}{M_p} - 1\right) \right)$$

which (for the sake of conciseness and interpretability) we can shorten to

$$M_{it} = Beta(\alpha_{m_{it}}, \beta_{m_{it}})$$

letting

$$\alpha_{m_{it}} = \left(\frac{1 - M_p}{M_c^2} - \frac{1}{M_p}\right) \cdot M_p^2$$

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[6]The exact derivation of this equation is omitted; for the full derivation, see the StackExchange answer from "assumednormal" in bibliography

and

$$\beta_{m_{it}} = (\frac{(1 - M_p)}{M_c^2} - \frac{1}{M_p}) \cdot M_p^2 \cdot (\frac{1}{M_p} - 1)$$

This formulation, while more unwieldy and difficult to read than the initial definition of a Beta, allows us to represent our message in terms of its mean and variance, an extremely useful trick. Let's break down each element defining that distribution.

By the definition of a Beta, $M_p \in (0, 1)$; this can be interpreted as saying that the position on an issue is centered somewhere in the interval $(0, 1)$. For different issues, that interval can be interpreted differently, and is not necessarily equivalent to the traditional left-right viewpoint. A foreign policy issue can be interpreted with 0 as the isolationist viewpoint and 1 as the interventionist view, for example, while a civil liberties issue can be considered authoritarian versus libertarian. Neither of those issues necessarily fall along the left-right divide, though there are certainly issues that do so. Throughout this thesis, I may refer to a certain theoretical issue as falling on a left-right or liberal-conservative axis, and I wish it to be understood that the usage of such terminology does not suggest that all issues are inherently divided along that partisan line.

Further, by solving these equations, it can be shown that[7]

$$M_c < M_p \cdot (1 - M_p) \implies M_c \in (0, 0.25)$$

M_c, the standard deviation of the message, can be understood as representing several things. Firstly, M_c can represent the *cuing strength* of the message; how powerful and specific the message is at declaring its position. Strauss argues for a slightly different understanding, calling the standard deviation the message's *persuadability*. Both definitions are in agreement that a lower value of M_c (and hence a lower standard deviation) implies that the message strongly declares its position. This suggests that most draws from the distribution come from the same range, or equivalently, most people understand the message to have the same meaning on the scale of relevance. Similarly, a higher value of M_c implies that the message conveys less information about its position, and draws from this distribution come from a wider range inside the unit interval.

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[7]See StackExchange answer from "assumednormal" in bibliography

Lastly, we define a function $S(M_{it})$, the *side* of a message, as follows

$$S(M_{it}) = \begin{cases} 0 & \text{if} \quad \frac{1}{2} < \int_0^{\frac{1}{2}} P_\beta(\alpha, \beta) \, dx \\ \\ 1 & \text{otherwise} \end{cases}$$

where $P_\beta(\alpha, \beta)$ is the probability density function of a Beta distribution, defined as

$$\frac{\Gamma(M_p + M_c)}{\Gamma(M_p) + \Gamma(M_c)} \cdot x^{\alpha-1}(1-x)^{\beta-1} \ , \ x \in (0,1)$$

and $\Gamma(z)$ is the Gamma function, the extension of the factorial function to real numbers, defined as

$$\Gamma(z) = \int_0^\infty t^{z-1} e^{-t} dt \ , \ z \in \mathbb{R}$$

In the case of M_{it}, $\alpha = \alpha_{m_{it}}$ and $\beta = \beta_{m_{it}}$, the parameters expressed in terms of the mean and the variance. The entire expressions are omitted for readability's sake. $S(M_{it})$ allows us to consider the "side" of the message by assessing if the balance of probability lies on one side or the other without us losing the necessary factors mentioned above that characterize the message as a continuous distribution; we still retain the message's information characterized in M_p and M_c, but this parameterization will become more useful soon. We can thus consider a message M_i as the tuple

$$M_{it} = (M_p, M_c, S(M_{it}))$$

Next, M_{it} is put out into the world, in many possible forms. Perhaps it is a policy proposal by a think tank; more likely it comes as a social media soundbite or an official advertisement put out by a campaign or a political action committee. The exact manner is irrelevant, but these examples illustrate the varied possible sources of a message.

Let's then consider citizen J. J, knowingly or unknowingly, has a *predisposition* P on issue i, denoted as P_{ji}.[8] Again, seeking a continuous distribution that ranges across the interval $(0, 1)$ leads to the natural

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[8]Like Zaller, I will not delve into the sources and exact nature of predispositions; this is certainly an extremely rich field of scholarship, but it is not the focus of this thesis. Suffice it to say that they are some combination of stable individual-level traits and the environment in which an individual lives. Further, we assume that over the short run, predispositions are stable.

choice of a Beta distribution to define J's predisposition. We can again define P_{ji} in terms of its mean μ_{ji} and variance σ_{ji}. Similarly, we write that

$$P_{ji} = Beta(\ (\frac{1 - \mu_{ji}}{\sigma_{ji}^2} - \frac{1}{\mu_{ji}}) \cdot \mu_{ji}^2, \ \ (\frac{(1 - \mu_{ji})}{\sigma_{ji}^2} - \frac{1}{\mu_{ji}}) \cdot \mu_{ji}^2 \cdot (\frac{1}{\mu_{ji}} - 1)\ )$$

which we can, similar to the process with M_{it}, reparameterize as

$$P_{ji} = Beta(\alpha_{ji}, \beta_{ji})$$

Though this looks complicated, recall that all we are saying is that individual J has a predisposition on issue i that's centered at some value μ_{ji} that sits somewhere between 0 and 1, with some degree of room on either side of the center.

3.1 Reception

Now, we move to the first question raised: how can we capture the probability that J receives M_{it}? Briefly drawing back to Zaller's Reception Axiom, he believes that an individual is more likely to receive a message if they have a higher level of political awareness. If we measure political awareness on a scale between 0 and 1, then in Zaller's model, it makes sense to let p_r be defined as an individual's political awareness. However, as Smets and Isernia show, the probability of receiving a message is empirically related to one's predispositions. They also make a compelling theoretical argument for the role of predispositions by paraphrasing Sniderman et al. (2011), writing that "awareness helps to put the cueing message in line with someone's predispositions, but predispositions in turn not only help people understand who is saying something, but also what is being said" (Smets and Isernia 2014, 393), which suggests an interaction between predispositions and awareness at the reception stage (ibid.). This is a claim that is not exclusive to those authors, but is echoed in much of the conclusions of contemporary political science research.[9] Druckman et al. compellingly write that "these types of biased [...] behaviors typically occur without conscious awareness, and they seem to be the norm in politics. Evidence to date shows that on political issues, even when encouraged to be accurate, individuals

[9] See Druckman et al. 2012, citing Iyengar and Hahn 2009; Kim et al. 2010; Lawrence et al. 2010; Taber and Lodge 2006, among others, for example

limit their searches to information that coheres with their prior opinions" (Druckman et al. 2012, 433).

Thus, consider the following definition of p_r.

$$p_r = a * 1 - |\mu_{ji} - M_p|$$

In this formulation, a represents an individual's level of political awareness, and the absolute value term represents the relative importance of J's predisposition. The further away the mean of P_{ji} is from the "position" of the message, the less clarity J has about the message, as it is further away from the predisposition. Hence, the absolute value term is effectively a distance metric, and subtracting that metric from 1 implies that the smaller the distance, the larger the role of predispositions. By multiplying these terms, we can represent the interaction effect suggested by Smets and Isernia's work. Further, since both a and $1 - |\mu_{ji} - M_p|$ must be contained in $(0, 1)$, the result must be contained in $(0, 1)$, so the boundary conditions on p_r are satisfied.

This approach is also still theoretically compatible with Zaller's Reception Axiom. Consider two individuals with differing levels of awareness but the same predisposition. Simply by analyzing the equation above, it is clear that the individual with higher awareness will have a higher probability of receiving a message, satisfying the Reception Axiom. For the sake of thoroughness, contrast this approach with Zaller's operationalization of reception (Zaller 1992, 134). He *assumes* that the probability of reception can be defined as the logistic function

$$p_r = 1 - \left[\frac{1}{1 + f + e^{\beta_0 + \beta_1 \cdot a}}\right]$$

where f represents a "floor parameter" to allow for the probability of those with "zero" awareness to guess correctly; β_0 represents the "intensity" of the message, and β_1 represents the strength of the relationship between awareness and reception. Notably the relationship between a and p_r is a monotonically increasing one both in this operationalization and in Zaller's. But, recall Zaller's claim above about people's information-seeking behavior. He continues with that, writing that his formulation makes the "implicit assumption that a person's predispositions [...] do not affect reception [...] this specification would be inappropriate if [...] indi-

viduals engaged in "selective reception" of political information – if, that is, they exposed themselves mainly to ideas they thought they were likely to find acceptable and avoided exposure to uncogenial ideas" (ibid. 139). As discussed above, in a new informational environment, it makes sense to allow for the possibility of predispositions to influence reception, whether intentional or not, given that so many people encounter political messages through social media algorithms tailored to existing political preferences.

Regardless of operationalization, it is clear that since an individual either receives or does not receive a message, we can construe a result of reception or no-reception as a draw from a Bernoulli random variable. A Bernoulli random variable is parameterized by some value p, and can be considered as a singular coin toss, where the probability of "success" is p and the probability of "failure" is $1 - p$. For example, "success" can be conceptualized as heads and "failure" as tails; alternatively, as a treatment that worked or a treatment that failed, or any number of other events where the outcome is strictly binary. In this case, we can say that reception is distributed as a Bernoulli where $p = p_r$ as defined above.

3.2   Acceptance

Now, let us assume that J has received M_{it}. On this topic, Smets and Isernia and Zaller are in agreement: both political awareness and predispositions play a role in whether or not an individual accepts a consideration, and both agree that the primary influence is predispositions, though that is conditioned by political awareness. Zaller also crucially writes that "the likelihood of resisting [i.e. not accepting] persuasive messages that are inconsistent with one's political predispositions rises with a person's level of political attentiveness", because it is only through political awareness that a citizen is able to recognize the compatibility (or lack of compatibility) with their own predispositions.

Let p_a be our probability of accepting message M_{it}. Define p_a as a function of M_{it}, the individual's understanding of the message they receive, a, their political awareness, and P_{ji}, their predisposition:

$$p_a = f(M_{it}, P_{ji}, a)$$

such that

$$p_a = 1 - |\mu_{ji} - g(M_c) \cdot a \cdot M_p|$$

where we define $g(M_c)$ as the logistic:

$$g(M_c) = -\frac{1}{1 + e^{-(k \cdot (M_c - 0.125))}}$$

Let's break down each component of the formula, beginning with $g(M_c)$. The goal of this seemingly abstruse function, which we can term the "interpretability" of the message, is to take the cue of the message, M_c, and "link" that to a scaling factor, allowing us to account for the fact that a more interpretable message will be more likely to be accepted, and a less interpretable message is less likely to be accepted. Since we know $M_c \in (0, 0.25)$, we seek a continuous function that maps the interval $(0, 0.25)$ to the interval $[0, 1]$ to preserve the conditions necessary for p_a to be a probability. While there are many choices for such a function, we also want our function to *decrease* as M_c increases and to increase as M_c decreases. This can be understood as saying that, as our message becomes less and less clear (and thus has a higher variance), $g(M_c)$ decreases, suggesting that the less cuing information the message contains, the lower the probability of acceptance. This makes sense from a theoretical perspective: the less understandable the message is to citizen J, the less likely they are to incorporate it. From a mathematical perspective, we seek $g : (0, 0.25) \mapsto [0, 1]$ such that the following are satisfied:

$$\begin{cases} \frac{d}{dx} g(x) < 0 \; \forall \; x \in (0, 0.25) \\\\ \lim_{x \to 0} g(x) \to 1 \\\\ \lim_{x \to 0.25} g(x) \to 0 \end{cases}$$

The logistic is a natural choice for this function, as it satisfies all the properties intrinsically. An experimental value of $k = -50$ was found to produce a logistic curve where the inferior and superior limits were accurate to three decimal places, a degree of tolerance that seems perfectly adequate.[10]

Next, by multiplying $g(M_c)$ by a, the political awareness of J, we account for the "contextual information" that Zaller specifies as necessary to relate a message to political predispositions. Finally, we fold in M_p, the

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[10]Additionally, further decreasing of k risks increasing the rate with which the function decreases, potentially causing steep changes in the impact of small changes of political awareness, an undesirable effect.

position of the message itself; this threefold multiplication allows us to "condition" the effect of the message by factoring in how clear the message is and whether the citizen has enough awareness to relate their predispositions and the message itself. If we term this the "conditioned message persuadability", we can then subtract that from the center of the individual's predisposition and then take the absolute value, as we did with p_r above. We then have a strictly positive distance metric contained in $(0, 1)$. But, since people tend to resist messages that are further away from one's political predispositions (as per the Resistance Axiom), we take the negative of this value and subtract it from 1, leaving us with a probability $p_a \in (0, 1)$ that satisfies all the conditions we seek.

Consider, for the sake of example, a citizen who has a predisposition with a center $\mu_{ji} = 0.4$ and $\sigma_{ji} = 0.065$ on a scale from 0 to 1, where 0 represents the case where someone is in favor of allowing all immigrants into a country and 1 represents the case of allowing no immigrants in. We can then, by the above formulas, see that our citizen's predisposition effectively takes the following form:

Figure 1: Example citizen's predisposition, with $\mu_{ji} = 0.4$ and $\sigma_{ji} = 0.065$

Plot of example citizen's predisposition
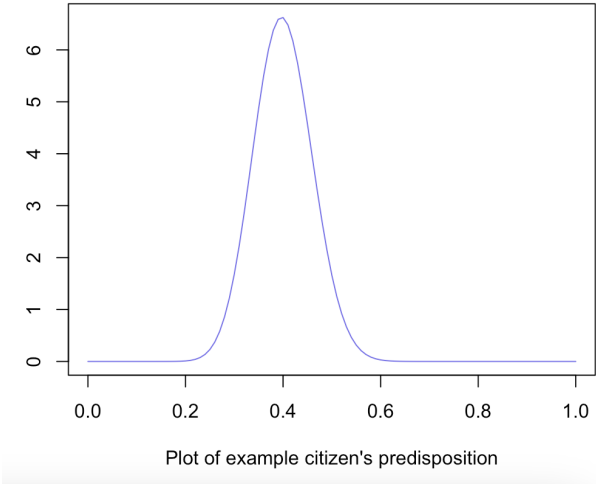
Let's take a moment to consider how Zaller parameterizes acceptance in his model. He writes that "the probability that an individual will accept a persuasive message (having received it) decreases with awareness and ideological distance from the message" (Zaller 1992, 137) and defines p_a as

$$\frac{1}{1 + e^{-\beta_0 + \beta_1 \cdot a + \beta_2 \cdot P_{ji}}}$$

reasoning that, as per his model, if higher levels of awareness should be associated with lower acceptance rates, the coefficient should be negative, and utilizes the inherent interaction effects present in a logistic function to allow for political awareness to "activate" those predispositions (ibid.) Regardless, again, since an individual either accepts or rejects a message, we can conceptualize acceptance as a Bernoulli where $p = p_a$, as above. Again, as in the reception step, p_a satisfies the same conditions expressed in the Resistance Axiom, despite the differing parameterization.

3.3 Integration

Now, we know that M_{it} has already been received and accepted by J. We make one small adjustment to the tuple that defines M_{it}. Once we know that message M_{it} has been accepted, we can redefine it as a *consideration* on issue i and accepted at time t. From this point on, I will refer to a consideration as representing a message that has already been accepted. Define a consideration, C_{it}, as:

$$C_{it} = (M_p, M_c, S(M_{it}), t)$$

where $t \in \mathbb{Z}^+$ is the time of acceptance, denoted here as a positive integer. Each subsequent consideration received and accepted will hence have a larger value of t.The next question is how to understand where C_{it} fits into the broader distribution of considerations. Define O_{ji} as citizen J's *opinion* on issue i. We have two options for understanding the ways by which J will incorporate C_{it} into O_{ji}.

3.3.1 Previous Zallerian Approaches

As far as Zaller himself is concerned, the theoretical mechanisms by which people integrate considerations are not incredibly important. Messages are considered as a binary between "dominant" and "countervalent" (ibid. 120), and as such, when a message is accepted, it is added in to the store of either dominant or countervalent messages, and that is that. However, as we no longer conceptualize messages as solely dominant

or countervalent, but instead somewhere in between, this approach can be tuned somewhat to a fashion that is more in line with our data. Additionally, he writes that "the entire RAS framework [...] fails to provide any mechanism for integration of information that has been acquired," acknowledging his choice to not include such a mechanism as one that was unnecessary and out of a desire to avoid overcomplicating the model (ibid. 290). This suggests that such an approach is theoretically reasonable, and, in this redefinition of the RAS model, a necessary one.

Alternatively, consider the formulation of Strauss, as mentioned above. Let O_{ji} represent the *opinion* of individual j on issue i, and say that j has accepted a total of M considerations on the issue. Strauss thus defines O_{ji} as a Gaussian Mixture Model (Strauss 2008, 23):

$$O_{ji} | \{M_{p_1}, \ldots, M_{p_M}\}, \{M_{c_1}, \ldots, M_{c_M}\}, \{\pi_1, \ldots, \pi_M\} = \sum_{m=1}^{M} \pi_m \cdot N(M_{p_m}, M_{c_m})$$

where the π_m represents the relative weight of consideration m, and $\sum_{m=1}^{M} \pi_M = 1$. Strauss suggests that $\pi_1 = \pi_2 = \cdots = \pi_M$, implying that $\pi_1 = \pi_2 = \cdots = \pi_M = \frac{1}{M}$, but this is only implied and is never made explicit (see Strauss 2008, 24 & 25, figures 2.2 and 2.3). This is a very reasonable framework, as it serves as a very clear and simple updating process; each additional message is added into the general mixture, and the total weight of each message decreases very slightly. The aforementioned steps of reception and acceptance can easily be fit into this framework, as well; the only necessary shift is that a consideration is characterized as a normal distribution, rather than a Beta. He makes this choice due to the inherent ease of combining many normal distributions, but this theoretical conceptualization of a consideration still adheres to all the theoretical guidelines necessary.

However, it is worth proposing an alternative operationalization for how individuals incorporate new information into their opinion distribution, which I will lay out and evaluate from an empirical and theoretical perspective in comparison to Strauss' framework.

3.3.2 An Approach Using Bayes' Theorem

While Zaller's framework of binary considerations makes the need for an updating process irrelevant, I follow Strauss (2008) and propose an application of Bayes' Theorem solely and simply to incorporate new data

into a distribution; as per Strauss, this does not necessarily suggest a Bayesian framework. At its most basic level, Bayes' Theorem takes a prior distribution and incorporates some observations to yield a posterior distribution and makes no argument about how those observations or prior distributions are generated, relying solely on the information at hand.

Bayes' Theorem, in its simplest form, is a statement about the relationship between conditional probabilities for two events. Bayes' Theorem states that

$$\mathbb{P}(A|B) = \frac{\mathbb{P}(B|A) \cdot \mathbb{P}(A)}{\mathbb{P}(B)}$$

For the purposes of this thesis, we consider A to be the distribution of O_{ji} before encountering our data, and B to be our data $(M_{i1}, \ldots, M_{iM})$. In the framework of Bayesian reasoning, we reformat this equation slightly, and we write that

$$\pi(A|B) \; \alpha \; \pi(B|A) \cdot \pi(A)$$

which focuses on three main objects of interest: $\pi(A)$, the prior distribution of A; $\pi(B|A)$, the data we encounter, and $\pi(A|B)$, what we believe about the distribution of A after encountering the data.

Now, let's focus in on each of those. Let's begin with our prior, $\pi(A)$. We seek to choose a prior distribution that accurately represents our understanding of O_{ji} before encountering any data.

Before we encounter the data, our subject J has some pre-existing opinion. Consider the scenario where J has not accepted any considerations yet. All they have to fall back on is their predisposition, whether conscious or unconscious. Thus, we can define their prior simply as their predisposition, P_{ij} as defined above. For reasons that will become obvious soon, whether or not J has accepted any considerations yet is somewhat irrelevant.

3.3.3 Data

Next, we wish to consider the best way to to specify the content of the information we incorporate to transform our prior distribution. Recall above our definition of $S(M_{it})$, the *side* of the consideration. Without loss of generality, we can assume that our subject has accepted a total of k considerations, each at unit time.

Thus, we can consider our data to be the $k-$tuple

$$(\ S(M_{i1}), \dots, S(M_{ik}) \ )$$

where $S(M_{it})$ is the side of the tth consideration on issue i. This is effectively a binomial set of data, as we recall again that each $S(M_{it})$ is either 0 or 1. As a result, with our prior and data defined, we can then combine the two into a posterior distribution: what we believe about citizen J's opinion after knowing they receive and accept certain considerations.

3.3.4 Defining our Posterior

Besides the inherent facts of the Beta and Binomial distributions that make them natural choices to define our prior and likelihood, respectively, there is another factor that makes this Bayesian update compelling. If we have a Beta prior and a Binomial likelihood, our posterior distribution is also a Beta distribution. This *conjugate pair* is of immense use theoretically and experimentally: it allows us to write down our posterior solely and simply as a function of the parameters inherent in the prior.

Assume again that citizen J has accepted a total of k considerations. Of those, let $z \leq k$ be the number of considerations where $S(M_{it}) = 0$, and hence there are $k - z$ considerations where $S(M_{it}) = 1$. Thus, we can write that

$$\pi(O_{ji} \mid (S(M_{i1}), \dots, S(M_{ik}))) = Beta(\alpha' + z, \beta' + (k - z))$$

where, as we noted in the definition of the predisposition above,

$$\alpha' = (\frac{1 - \mu_{ji}}{\sigma_{ji}^2} - \frac{1}{\mu_{ji}}) \cdot \mu_{ji}^2$$

and

$$\beta' = (\frac{(1 - \mu_{ji})}{\sigma_{ji}^2} - \frac{1}{\mu_{ji}}) \cdot \mu_{ji}^2 \cdot (\frac{1}{\mu_{ji}} - 1)$$

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Recalling our above definitions of α' and β' as they apply to the predisposition, we note that the only difference is the addition of the z considerations with side 0 to α' and the $k - z$ considerations with side 1 to β'. Otherwise, they have the same formulation. Hence, we can see that the way that we incorporate each consideration is that we calculate its side, the value of which shifts our predisposition towards 0 or 1, respectively, depending on the value taken by $S(M_{it})$. Exploiting this incredible property of conjugacy allows us to see that the curvature (that is, the general nature of the distribution itself) of J's predisposition is *time-invariant*, an incredibly important finding. Furthermore, the conjugacy of the beta distribution, given a binomial set of data, is an application of Bayes' Theorem that neatly sidesteps the question of Bayesian reasoning versus motivated reasoning. This is due to the fact that this usage of Bayes' Theorem has no requirements for how the data is generated[11]; in this case, it comes from the steps of reception and acceptance above that are consistent with Zaller, but it could have arisen in a way more suited to Bayesian reasoning. In this case, Bayes' Theorem, just as utilized by Strauss, provides a neat way to incorporate new data into a distribution. After this step of integration, we now can understand how J's opinion on issue i will be defined regardless of how many considerations are accepted one way or another.

Finally, we can utilize another convenient property of this parameterization. Again, say that J has received and accepted a total of k considerations on issue j. We then can effectively consider our posterior distribution after accepting our considerations, O_{ji}, as our new prior distribution if we are to accept a $k+1^{th}$ message. In general, as a result of this, whenever we have to update our distribution with new data, we can simply plug in our old posterior as our new prior.

3.4   Sampling

Now that we have an idea of what the posterior distribution O_{ji} looks like after accepting considerations, we now have to understand what it means to sample from that distribution in context and contrast that with Zaller's approach.

We begin with Zaller's formulation and his theory of the survey response. He writes that "survey responses are a function of immediately accessible 'considerations', where the flow of information in elite discourse determines which considerations are salient [...] different considerations happen to be salient at different

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[11]For a proof of this, see the appendix.

times, which causes people's survey responses to differ over repeated interviews" (Zaller 1992, 36). Further, as his Accessibility Axiom claims, considerations that have more recently been activated (whether thought about or called to mind by an outside source) are more easily retrieved from memory. His Response Axiom constructs a two-step process, where first an individual calls to mind a certain number of considerations, and then averages across them to construct a response.

Let's consider what this looks like in our parameterization. If we were to consider a simple, unconditioned survey response, we could just define citizen J's response on issue i at time t as R_{it}, a random draw from our opinion O_{ji}, such that

$$R_{it} \sim O_{ji}$$

where O_{ji} is the latent posterior distribution defined above. However, we must attempt to factor in the importance of recency that aids in the recollection of considerations, per Zaller's third and fourth axioms. As such, consider the following proposal for a process that governs how distributions are sampled from the latent posterior.

Firstly, as Strauss writes, "Zaller's 'sample' step implies that reported political judgements are draws from random variables," (Strauss 2008, 16) suggesting that we can still define R_{it} as a draw from our opinion. The question then becomes how to subset the opinion.

Recall that during the step of integration, we noted a key defining element of a consideration C_{it} was t, the time of reception. Let's slightly alter this definition, and let s replace t to define the moment in time when the message was last made salient. This can happen in any number of ways. Perhaps citizen J sees an ad on issue i that harks back to a previously accepted consideration, or J has a conversation that reminds them of a consideration they've internalized. Alternatively, if the consideration is not made salient after intake, then $s = t$. Regardless, we can then define the probability of recalling C_{it} as $\mathbb{P}(\text{recall } C_{it}) = \frac{s}{\max t}$, where max t is the maximal attained time so far. Hence, any consideration can plausibly be sampled, but considerations that have been thought of or accepted more recently will have a higher value of s, and thus their probability of being sampled will thus be higher.

As a short but useful aside, consider a scenario where an individual is asked a question on a poll and

samples some $m \leq k$ considerations through this time-weighted process, where k again represents the total

considerations that J has accepted. We then seek to characterize O_{ijm}, the opinion of individual j on

issue j after sampling m considerations. We can still perform the same binomial updating process outlined

in Section 3.3.4, and see that our resulting distribution will still be a Beta distribution. This proof is

obvious; all m considerations contain a side through our definition, and we can thus construct our "sampled

opinion" through the same process outlined above, just with specifically the m considerations rather than

the entire set of k considerations. This accounts for Zaller's third axiom of accessibility. We conclude with a

simple reformulation of Zaller's fourth axiom: instead of individuals averaging across considerations that are

immediately salient, they instead make a draw from the distribution of salient considerations. Say $a \leq m$

considerations have side 0, and thus $m - a$ considerations have side 1. Combining our statements in Section

3.3.4 and the definition of a draw from a random variable, we can write that

$$R_{it} \sim Beta(\alpha_{ji} + a, \beta_{ji} + (m - a))$$

where, as we know by section 3.3.4,

$$\alpha_{ji} = (\frac{1 - \mu_{ji}}{\sigma_{ji}^2} - \frac{1}{\mu_{ji}}) \cdot \mu_{ji}^2$$

and

$$\beta_{ji} = (\frac{(1 - \mu_{ji})}{\sigma_{ji}^2} - \frac{1}{\mu_{ji}}) \cdot \mu_{ji}^2 \cdot (\frac{1}{\mu_{ji}} - 1)$$

This formulation allows us to perform a time-weighted sample of all accepted considerations, define a new

distribution of opinion with the same curvature as our latent opinion, and then sample from that distribution,

as desired by Zaller's Accessibility and Response Axioms.

However, there is one notable caveat. We note that even after integrating k considerations over some

interval of time, our predispositional mean and variance are still the same; our α_{ji} and β_{ji} have not changed.

This is a significant but necessary assumption: ***predispositions are stable over the short run***. I leave the

precise definition of the "short run" undefined, but note that in this modeling scheme there can be significant

work done to understand how true this is and the exact definition of the "short run". This assumption, while unwieldy, is a necessary one. Zaller delves into this, writing that "it is likely that, over the long run, the [...] ideas that one internalizes have some effect on one's values and other predispositions. But however this may be, [*Mass Opinion*] is a study of opinion formation and change in particular short-term situations, and for this purpose, the long-term influence of [...] [messages] on predispositions, to the extent that it exists, may be safely neglected" (Zaller 1992, 23). While this is a necessary yet important simplification, it also lends some validity to my approach, suggesting that despite all the fancy α_{ji}, this dense discussion of Bayesian updating, and the motivated reasoning arguments, my model is clearly grounded in Zaller's work and serves as an extension of his model, rather than the radical departure that it may appear to be on its face.

3.5   The RAIS Model: An Overview & Chapter 3 Summary

In evaluating his own work, Zaller writes that "what would be most desirable, then, is not the RAS model I have proposed, but a Receive-Accept-*Integrate*-Sample model" (ibid. 281). While I am not so bold as to declare my model as "most desirable" per se, it does include this improvement inherently, and the four steps of my model are reception, acceptance, integration and sampling; additionally, I rather like the name. Hence, I call my model the RAIS Model, as it improves on Zaller's RAS model by adding an "integration" step between the acceptance and sampling stages. From the steps taken along the way, this model clearly satisfies all of Zaller's four axioms for the RAS model, and builds on it from a theoretical perspective to incorporate the three decades of research that have come since the 1992 publication of *The Nature of Mass Opinion*. For the sake of interpretability, I include here a summary of the proposed RAIS model as I have defined it.

- A message M on issue i is put out into the world at time t. We characterize the message as a tuple consisting of its *position* M_p, a *cue* M_c, a "side" $S(M_{it})$, and the time that it is released.

- Simultaneously, we consider a citizen J as having a *predisposition* on issue i, where the predisposition characterizes J's *position* and *openness*. We call this predisposition P_{ji}.

- The probability that citizen J receives M_{it} is a function of their political awareness and how close the

message is to the position of P_{ji}. This accounts for Zaller's Reception Axiom.

- The probability that citizen J, after receiving M_{it}, accepts the message, is a function of their political awareness and how close the message is to their predisposition, provided that they are able to understand how the cue of the message relates to the predisposition. This accounts for Zaller's Resistance Axiom.

- Once J accepts a message, depending on the side $S(M_{it})$ of the message, we consider the message to be a *consideration*. Their opinion then shifts towards the side $S(M_{it})$ of the consideration, using Bayes' Theorem to integrate the consideration into their opinion. This step defines the "Integration" part of the RAIS model.

- When asked a question on a survey or poll, J begins by searches their memory and coming up with a sample of considerations; the probability that a given consideration is sampled is proportional to how recently the consideration was accepted or was actively thought about. This step accounts for Zaller's Accessibility Axiom.

- This sample of considerations can be used, along with P_{ji} to characterize a probability distribution similar to, but not necessarily equal to, their latent opinion. Their response to the question that they have been asked is thus a draw from that distribution. This accounts for Zaller's Response Axiom.

This ends the outline of the proposed RAIS Model and defines the differences between the RAS and RAIS models.

4 Tests of the Model

"It's like you have a big network of variables, and you grab the one you care about, and you shake it and shake it." -Andrew Gelman, on the process of modeling

Broadly speaking, the goal of this chapter is twofold. With the RAIS model set up, there are two main questions to consider: how can we test this model, and what data should we test it with? To answer the first one, I will first outline some of the work that Zaller does to test his model in *Mass Opinion*, and then sketch an outline of how this thesis can utilize his framework to attempt to confirm the validity of the RAIS model in addition to utilizing the work of the critical authors. Next, with our framework for analysis set up, I will then introduce a dataset that I believe satisfies the conditions for a useful test of the RAIS model and argue for its utility. Then, I will proceed to an analysis of the dataset and attempt to perform the delicate task of mapping the RAIS model onto the dataset.

4.1 A Further Review of *Mass Opinion*

Up to this point, my review of *Mass Opinion* has focused primarily on its development of the RAS model, with a brief sidebar for a discussion of the psychological literature in which *Mass Opinion* is situated. However, the book is not famous just for the model, but also for the many deductions and claims that Zaller proves using the RAS model. To decide which experiments I will conduct, it is worth exploring in detail some of the tests that Zaller himself conducted. Furthermore, in analyzing how exactly the RAS model is fleshed out, there is huge utility to be gained for the RAIS model, as Zaller includes several painstakingly detailed pages of probabilistic work to explore his work, which saves the trouble of re-deriving these equations for the RAIS model.

Much of Chapter 4 of *Mass Opinion*, which proceeds immediately from the model outline, revolves around a series of deductions that begins by taking data from the 1987 ANES pilot study to provide some exploratory analysis of how exactly the considerations evaluated at the time of question-asking influences a reported opinion. Zaller, who helped design the 1987 ANES, notes that the study, by utilizing a wave approach that asked about both standard issue questions *and* the considerations that informed respondents' answers to those questions, is able to largely determine the effect of those considerations on general attitude

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reports, with some margin of error due to inter-coder reliability issues and sample size issues. However, despite the inherent selection bias issues of a wave study, the short response time between interviews (which limits the possibility for attitude change and response instability), and the preceding issues–all of which are inherent problems with surveys in general and which cannot be escaped–the 1987 ANES provides an incredible and unique framework for analysis of the RAS model. It provides data which, to this day, has not been replicated in any major study with even passing similarity or similar sample size, and hence is an incredibly useful tool for Zaller's analysis.

The data reveals remarkable support for the crucial claim of the RAS model: even when individuals are not forced to evaluate their internal considerations prior to answering a question, nearly 75% of respondents report considerations that are at least somewhat conflicted, revealing clear ambivalence on political issues for the majority of the population (ibid. 62). Furthermore, a review of the correlation between the directional coding of open-ended considerations and the direction of self-reported closed-ended opinion statements reveals that there is a sizable connection between the two, which validates the memory-based RAS model over similar online models (ibid. 63) and lends support to the broader psychological theory that grounds the RAS model (and thus the RAIS model), in addition to providing empirical justification for its axioms. Zaller then utilizes the RAS model's axioms to provide several possible explanations for the widespread response instability that is found in surveys. He notes that, since response instability "consists largely exclusively of chance variation around a largely stable central tendency" (ibid. 65)[12], those with higher political awareness (and thus more coherence in the considerations they have accepted) should exhibit lower variation in their survey responses. Utilizing data from the 1987 ANES pilot study along with experimental results, Zaller shows that, generally speaking, better informed persons both form considerations that are more ideologically consistent with their predispositions and that they also display greater response stability over time (ibid. 66). Zaller also clarifies that the results presented show that political attitudes are unstable and that they sample from a pool of internally conflicted considerations–but that it is necessary to show a chain of causal reasoning. Creating a model to test if a change in reported attitudes is consistent with a change in the directional thrust of considerations, Zaller finds both statistically significant support for the hypothesis *and* that there is a large

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[12]citing Converse, 1964; Achen, 1975, Dean and Moran, 1988; Erikson, 1979; Feldman, 1989; and many others

degree of correlation between the consistency of internal considerations and over-time survey responses, suggesting that high levels of internal consistency do lead to more stable responses, as expected, despite the inherent problems of coding open-ended remarks which impacts the model's fit (ibid. 71).

Ultimately, Zaller makes the powerful conclusion that one interview's measure of ideological consistency (that is, the mix of salient considerations) has very little capacity to predict response instability across a multiple-wave sample; hence, tests of the model that utilize multiple interviews are much more valuable, as response instability tends to wash out through the process of repeated interviewing. Zaller concludes this chapter by declaring that his theory is not necessarily a radical departure from the then-mainstream and still relevant theory of measurement error discussed in the literature review. In both the RAS model and the widely accepted view, unclear language and question framing cause response instability; however, in Zaller's view, those factors take advantage of the inherent instability in peoples' attitudes and cause different considerations to be brought to mind leading to response instability; this is theoretically opposed to the mainstream model, in which response instability is effectively meaningless noise whose existence is a nuisance rather than an object of investigation (ibid. 75).

In the next chapter, Zaller explores the idea of "salience effects", grouping together several empirical regularities that have been proven to affect the relative salience of considerations. Generally speaking, these effects can generally be classified as *priming effects*, which Zaller specifically outlines in addition to other examples like the race of an interviewer or the effect of question-wording. For the purposes of this thesis, the key takeaways come from Zaller's foray into priming, which he characterizes in several ways. Firstly, the impact of the way that a topic is framed in elite discourse or the news media can impact the considerations that citizens use in making attitude reports; or, alternatively, the ways that a question is framed on a survey can cause different considerations to be activated, in the traditional sense of "priming" (ibid. 81).

Zaller's terminology in this setting is slightly unclear and is largely separate from the broader language that the political science community uses on issue salience, and hence it is worth a slight digression to explore his theory within a more common framework. Furthermore, by placing *Mass Opinion* within the larger discussion of issue salience, there are decades of experimental research that can be used to unpack Zaller's conclusions. Scheufele and Tewksbury (2007) provide a useful and concise summary for the three primary

mechanisms which political scientists use to analyze how considerations are made more salient: priming, framing, and agenda-setting. The three are related, but ever so slightly different. Scheufele and Tewksbury (2007) define *agenda-setting* as "the idea that there is a strong correlation between the emphasis that mass media place on certain issues (e.g., based on relative placement or amount of coverage) and the importance attributed to these issues by mass audiences" (Scheufele and Tewksbury 2007, 11). *Priming*, on the other hand, refers to "changes in the standards that people use to make political evaluations", occurring when "news content suggests to news audiences that they ought to use specific issues as benchmarks for evaluating the performance of leaders and governments" (ibid., citing Iyengar and Kinder (1987), 63). Priming, effectively an extension of the agenda-setting theory, is further grounded in the memory-based model that undergirds Zaller's work, as both implicitly assume that "media can also shape the considerations that people take into account when making judgments about political candidates or issues" (ibid.). Framing, in contrast, "is based on the assumption that how an issue is characterized in news reports can have an influence on how it is understood by audiences" (ibid. 11).

Regarding the differences between agenda-setting and priming versus framing, the authors quote Price and Tewksbury (1997), who write that

> Agenda setting [sic] looks on story selection as a determinant of public perceptions of issue importance and, indirectly through priming, evaluations of political leaders. Framing focuses not on which topics or issues are selected for coverage by the news media, but instead on the particular ways those issues are presented.

In short, as the authors write, "the primary difference on the psychological level between agenda setting and priming, on the one hand, and framing, on the other hand, is therefore the difference between whether we think about an issue and how we think about it" (ibid. 14). Further, Scheufele and Tewksbury argue that agenda-setting and priming should be understood as *accessibility-based* models, where the models assume that "media can make certain issues or aspects of issues more accessible [...] thereby influenc[ing] the standards [people] use when forming attitudes about candidates and political issues" (ibid. 15). In contrast, framing works more in the field of *applicability*, which "refers to the outcome of a message that suggests a connection between two concepts such that, after exposure to the message, audiences accept that they are

connected", effectively creating an information heuristic between a previously generated consideration and a new one (ibid.). Despite the theoretical differences between the accessible and applicable models, Scheufele and Tewksbury admit that "as a point of clarification, it must be noted that accessibility and applicability cannot be completely isolated from one another. [...] the phenomena jointly influence whether a construct will be activated in a given situation" (ibid. 16). For the RAS model, in effect, this means that despite the unclear language that Zaller uses and the differences between his terminology and the wider language used by political scientists, these distinctions are theoretically interesting but ultimately do not affect the broader mechanisms at play in the RAS model.

Moving back to *Mass Opinion*, Zaller then proceeds to evaluate the general use of summary judgments typical to polling questions. These are the classic questions asked on a poll: whether abortion should be permitted or not, whether one approves of the President or not; and so forth. Zaller grandly writes that "there is absolutely no reason to suppose that a person must feel consistently about each of the elements he aggregates across when making summary judgments" (Zaller 1992, 92). This is not a repetition of his previous argument that citizens are ideologically inconsistent across issues. Rather, Zaller doubles down, believing that "many citizens are, in effect, equally inconsistent in their reactions to different aspects of *the same issue* [emphasis added]" (ibid. 93). This is why characterizing opinion as taken on multiple surveys by different agencies and different reporters is such a difficult task. Not only can the specific conditions that cause considerations to be made newly salient (question-ordering, sheer chance, news media priming) be so different, citizens do not even have a guarantee of ideological consistency within an issue, making the task all the harder. This is another reason, Zaller argues, for the theoretical machinery that is the RAS model: a way to recognize this diverse set of considerations and to reckon with the limited information revealed by each response.

This discussion is followed by Zaller's analysis of the *mainstream* and *polarization* effects, which explore the changes in large-scale public opinion when elite messaging is in consensus and when it is roughly evenly divided, respectively. For the sake of this thesis, the polarization effect is both more empirically interesting and more testable utilizing actual data, and hence will receive a larger focus than the mainstream effect. However, it is worth an overview of the RAS model's claims in the case when elite messaging is in consensus.

Citing a copious body of research across both political science and psychology, Zaller claims that, in the mainstream effect, "correlations between [political] awareness and support for a policy should be strongest when elite consensus is strongest," (ibid. 99) as "the greater a person's level of political awareness, the greater the number of mainstream messages the person would internalize in the form of considerations and hence, all else equal, the greater the person's level of expressed support for the mainstream policy" (ibid. 98). However theoretically interesting the mainstream effect is, a large part of the actual utility of a model comes from its applicability to actual discourse, which much more often is polarized and includes elites who are divided on either side of an issue. Zaller writes that, in this situation, "in the case of an evenly divided partisan elite and a balanced flow of partisan communications, the effect of political awareness is to promote the *polarization* of attitude reports" by allowing more highly aware partisans to incorporate more ideologically consistent considerations (ibid. 101-102). After exploring examples like the Iraq War and the Vietnam War, it becomes clear that political awareness, specific policies, and positions taken by elites can all interact in complex ways and affect mass attitudes in ways that require a deep and thoughtful dive; this is further explored in Zaller's creation of a two-message model.

The next crucial step of *Mass Opinion*, now that the basic processes of attitude formation have been laid out, is to discuss how it is possible that mass attitudes have changed. Through the RAS model, there are two possible ways that this may have happened. Firstly, as discussed above, there may have been changes in the relative salience of preexisting considerations, due to priming and agenda-setting or by framing. Either way, Zaller notes that salience effects do not involve an inherent shift in the underlying public feeling towards an issue, and calls a persistent shift in salience a "mood change". Since mood changes and attitude changes are empirically difficult to separate, Zaller moves away from their analysis in favor of a more fundamental analysis of true attitude change. Through the RAS model, this requires an alteration in the balance of considerations in people's minds and, hence, their long-term response probabilities (ibid. 119). For example, if one's opinion shifts in one direction on an issue, they may still form more considerations supporting the other side throughout the process of change; they just must form more of the prevailing side's considerations. This process is activated largely in part due to changes in the relative intensity of communications, as the relative prevalence of opinions is a function both of awareness and the information environment. In short:

as messages of a certain side increase in intensity, we should expect a public opinion shift in the direction of the more intense side. To analyze how individuals change their attitudes, Zaller begins by analyzing how people resist attitude change in the direction of a momentarily dominant message. There are three ways that this may happen, in Zaller's view: partisan resistance, where people's predispositions cause them to refuse dominant messages that they recognize as inconsistent; inertial resistance, where a large store of considerations already present reduces the relative impact of new ones; and countervalent resistance, where individuals happen to absorb more of the considerations that are less dominant at the time. In the RAS model, each of these probabilities increase with political awareness, as is evident by a review of Zaller's axioms in the second chapter of this thesis.

Utilizing these factors, Zaller begins to finally develop a testable model of attitude change. While his initial work focuses on a one-message form of attitude change, where one singular message gains in relative intensity as opposed to a more realistic two-message model (whose development will be analyzed shortly), this pared-down model allows for a deeper understanding of the processes that he uses to test the RAS model in terms of attitude change and can inform a test of the RAIS model. Zaller first defines the probability of attitude change, utilizing heavily from McGuire (1969), as

$$\mathbb{P}(\text{Change}) = \mathbb{P}(\text{Reception}) \cdot \mathbb{P}(\text{Acceptance} \mid \text{Reception})$$

where $\mathbb{P}(\text{Acceptance} \mid \text{Reception})$ represents the probability of acceptance conditional upon reception. This is both a useful and necessary model, because considerations are incredibly difficult to measure in most attitude change situations, and depicting attitude change this way allows a pivot to the domain of probability and hence explores the probability of change in a person's summary attitude report, something much more measurable on a survey. Furthermore, it still manages to depict the reception-acceptance model of attitude change that is laid out in the RAS model. As Zaller admitted in the introduction, "the breadth and generality at which I am in this book has been achieved at the expense of strong assumptions and some important simplifications," and this is certainly no exception to that (ibid. 2). However, as he is sure to explain, this "equation can [...] be filled out in a way that implicitly accommodates the effects of both considerations and countervalent messages on the incidence of attitude change" (ibid. 123). Interestingly, Zaller notes that,

since the probability of reception is a strictly increasing function of political awareness, and the probability of acceptance is a decreasing function of political awareness (since more aware people are more resistant to the effects of dominant messages inconsistent with predispositions), then the resulting multiplication of the two functions should lead to a non-monotonic model of attitude change (ibid.). This suggests that the probability of attitude change is highest among those with the most average levels of political awareness and is lower among the least aware and the most aware.

Upon reflection, this is perhaps not a surprising result when reasoning backwards from the state of political campaigning today. Much discourse and advertisements appeal to the theoretical ideal of the "moderate" or the "swing voter", and the RAS model seems to suggest that messages received by moderately aware centrists and out-partisans are the most likely to spark change in the receiver, suggesting the truth of the current model of political campaigning. And it makes sense that this is the theoretically most advantageous approach. That being said, this must be taken with a significant grain of salt. Zaller is quick to add that this non-monotonic pattern of change is not the only possible one depicted by the reception-acceptance model specified here and not necessarily an intuitive one; the pattern of attitude change and the specific fashion of which awareness is correlated with acceptance is highly context-dependent and is not generalizable to fields outside politics. To do this, he proposes two different learning situations: hard learning (exemplified by a college physics lecture) and easy learning (listening to a speaker repeat a simple phrase over and over). In the hard learning situation, those with higher awareness are both more likely to receive the contents of the lecture effectively and to accept the contents of the lecturer, suggesting a monotonically increasing pattern of change. In contrast, in the "easy learning" situation, he argues that everyone hears the simple phrase, but those with lower levels of awareness are much more likely to accept the message, rather than those with high levels of awareness, who tune it out. Hence, it is not entirely obvious what about political awareness implies that this non-monotonic pattern would hold.

Zaller argues that the pattern is not necessarily non-monotonic across all groups, but rather is conditional upon political grouping. That is, someone predisposed against an issue might, as a function of awareness, have a monotonically decreasing function of acceptance, while someone predisposed towards an issue might have a similarly monotonically increasing function of acceptance. Hence, the probability of change is monotonically

increasing in the second case and non-monotonic in the first case[13]. Thus, when examining patterns of attitude change and generating predictions, it is crucial that hypotheses reflect these possible variants of the general pattern. Crucially, though, there is one caveat. Consider the following example that Zaller provides, where individuals are sorted as liberal, centrist, or conservative, and further defined as having awareness levels of low, middle, or high. Among the lowest aware, he defines their probability of receiving a liberal message as 0.1, the middle group as 0.5, and the highest aware as 0.9. He then defines the probability of acceptance, given reception, for each subgroup. The results can be multiplied by each other, utilizing the equation above, to yield each subgroup's probability of attitude change. The results can be seen in the table below.

Attitude change in response to a liberal message within three ideological groups

| | Level of awareness | | | | | | | | |
| | Among liberals | | | Among centrists | | | Among conservs. | | |
	Low	Middle	High	Low	Middle	High	Low	Middle	High
Prob(Reception)	.10	.50	.90	.10	.50	.90	.10	.50	.90
Prob(Accept | Reception)	.90	.85	.80	.90	.55	.20	.90	.46	.02
Change(Reception × Acceptance)	.09	.425	.72	.09	.275	.18	.09	.23	.018

Figure 2: Table of Attitude Change Probabilities (reproduced from Zaller 1992, 127)

Interestingly, the likelihood of attitude change within the out-group (that is, the non-liberals receiving the liberal message) is highest not just with the most moderately aware centrists, but shortly followed by the most moderately aware conservatives. But, further, note the differences in the probabilities of attitude change between all groups. These probabilities, while entirely made up, serve to illustrate the important point made in the last paragraph: that drawing large-scale conclusions about the impact of political awareness on attitude change is necessarily conditional upon further subgroups as well; in this case, political predispositions.

Moving onwards, with these processes outlined, Zaller's next chapter goes through a series of tests of his one-message model. He begins by outlining message-level determinants of attitude change, as opposed to the individual-level factors just analyzed. The two primary message-level factors that systematically affect attitude change are the relative intensity of change-inducing messages and the familiarity of the message.

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[13]see Zaller's examples in ch. 7 of *The Nature and Origins of Mass Opinion*, e.g. 125, 126, 127

By intensity, Zaller means both the relative reach of the message and the capacity of audiences to recall the message (ibid. 151-153). Perhaps providing Strauss (2008) with fruit for his thesis, Zaller writes that "the greater [peoples'] concern and initial knowledge, the more likely they are to notice and comprehend additional information that comes their way" (ibid. 152). Furthermore, messages may also vary in how familiar the public is with their corresponding issue. To combine the two, Zaller writes that "the lower the intensity of the message, the smaller the proportion of attitude change that occurs among less-aware persons", and "a higher proportion of the attitude change on more familiar issues (compared to less familiar issues) is concentrated among less-aware persons" (ibid. 153). Hence, any analysis of attitude change requires an evaluation of the information environment in which a message and issue exists as well as analysis of the individual-level traits that impact change. Unfortunately, specific data on the "intensity" or "familiarity" of a message is often unreliable or difficult to construct, as intensity is far more than the amount of media attention devoted to a subject, and familiarity is difficult to separate from awareness at a measurable level (ibid. 158).

This discussion is followed by a theoretical analysis of how the dynamics of considerations impact resistance to attitude change. Referring back to the 1987 NES pilot study that taps specific considerations, Zaller explores the available evidence for the effect of partisan resistance, inertial resistance, and countervalent resistance, the three possible forms that Zaller has taken up already. Unsurprisingly, data from the study shows that political awareness has a positive relationship with the acquisition of consistent considerations (ibid. 170-171) and further, it has a nonmonotonic relationship with the acquisition of inconsistent considerations, similar to the aforementioned arguments, suggesting that there is evidence for partisan resistance, though the muddiness of the data makes that conclusion a cautious one.

Finally, Zaller arrives at his more involved model, the one which is most relevant for the purpose of this thesis and the most generalizable: his two-message model of attitude change, effectively summarizing and extending all his previous work into a fashion that is testable in a wide variety of real-world situations, since, as he admits, public opinion is "rarely completely one-sided over any appreciable length of time" (ibid. 185). Zaller's big takeaway from the chapter is that "public opinion can be understood as a response to the relative intensity and stability of opposing flows of [...] communications" (ibid. 185-186). After a brief analysis of factors that make public opinion on the Vietnam War a worthy candidate for analysis (the

specifics of which will be discussed along with the dataset of interest for this thesis in the next subsection),

Zaller attempts to outline the possible projected outcomes of how changes in the flow of communications

will affect mass opinions. Overall, the specifics of how opposing communications affect different segments of

the population, by predisposition and awareness, vary by message intensity[14]. To construct his two-message

model, Zaller then alters the one-message model slightly, to incorporate the "ideological coloration" (ibid.

191) of a message, effectively the "side" of the message defined above in the RAIS model, along with the

impact of the time a message is received or accepted. To build his indicator of predispositions on the Vietnam

War, Zaller relies on a measure of "hawk-dove" opinion, as it serves as "the dimension of left-right orientation

most likely to affect opinions toward the Vietnam War" (ibid. 196). After estimating his model, Zaller finds

significant evidence for the hypotheses of the RAS model, and further shows that attitude change is far

from a monolith, and shifts in attitudes are highly dependent on prior opinion, time, and relative message

intensities (ibid. 207).

4.2   Data and Methods

With the relevant sections of Zaller reviewed, the proposed RAIS model outlined, and the two of them

compared and contrasted from a theoretical viewpoint, the next question to ask is how can the models be

validated and how can they be compared empirically? In order to do this, we seek to understand what

conditions the dataset satisfies and how this relates to the RAIS model. I refer back to Dobrzynska and

Blais, who themselves attempted to create a systematic test of the RAS model. Their goal is to provide a test

of Zaller's RAS model as it relates to two-sided information flows, which were just outlined in the preceding

section of *Mass Opinion*. In order to evaluate whether this dataset adequately satisfies the conditions for a

useful test of the RAIS model, I combine an analysis of Zaller's work and that of Dobrzynska and Blais.

Beginning with Zaller, the factors that led him to set up his specific experimental setup (the Vietnam

War) are threefold. Firstly, he claims that there was a rapid change in elite positions on the Vietnam War;

secondly, that there were changes in the relative intensity of the pro-war and anti-war messages throughout

the war; finally, he uses the fact that the Vietnam War changed from a mainstream issue in 1964 to an issue

of political polarization by 1970 (in this case, meaning that predispositions effectively served as a heuristic

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[14]see Zaller 1992, 151-153 for his definition of intensity.

for opinions) (ibid. 186). Each of these facts effectively allows Zaller to test different aspects of the RAS model; namely, the effect of political awareness in conditioning responses to changes to each of the preceding factors. Hence, in attempting to conduct a test of the RAIS model as Zaller does, we seek a similar situation that accurately reflects a polarized media environment where elite positions shift, media message intensities shift, and where ideologies serve as an approximate heuristic for opinions.

Next, consider the work of Dobrzynska and Blais. They chose the 1988 Canadian election, centered around a proposed Free Trade Agreement between Canada and the USA, to test Zaller's work. The authors list three primary reasons they chose this election, echoing Zaller above: "the balance, intensity and familiarity of the messages" delivered in the election (Dobrzynska and Blais 2008, 271). In terms of balance, the authors write that "the issue [evenly] polarized the political elite and the result was a bidirectional message" (ibid. 263). As for intensity, the authors conduct a brief analysis of the media environment around the election, and conclude that "the two competing messages [pro- and anti-agreement] were of similar intensity" (ibid.), and they cite Johnson et al. (1991), who note that that "coverage of the FTA is striking for its balance" (ibid. 264) despite some natural fluctuation in favor of positive or negative messaging over the campaign. In terms of familiarity, the FTA contained "many concrete elements whose concrete implications were difficult to predict" (ibid. 263), and hence was an issue upon which voters had little familiarity and so formed opinions throughout the course of the "fiercely debated" campaign (ibid.). This relative unfamiliarity meant that the CES (Canadian Election Study) would be able to track the formation of opinion and thus avoid the potential problem of reckoning with the inertial resistance effects predicted by Zaller's model. In a more familiar election, it would necessarily be more difficult to change voters' minds, as they would have already accumulated a large store of considerations and hence any evidence of opinion shift would be difficult to measure.

As discussed in the literature review, the 1988 CES is remarkable in that, not only does it provide data on respondents' political awareness and predispositions, it also contains responses that allowed the researchers to operationalize both reception and acceptance of messages. Further, the survey took a multiple-wave sample of respondents; again, as discussed in the literature review, the exact timing of these waves is perhaps problematic when assessing the conclusions of Dobrzynska and Blais, but the base on which they build their

analysis is twofold. Additionally, the authors are heavily reliant upon the idea of the 1988 Canadian election as effectively a single-issue vote. If the election were debated around multiple topics, then a choice of vote could come from any number of issues, and one could receive and accept enough issues to change their mind on an issue without affecting their vote, or one could change their vote based on other issues entirely. The single-issue nature of the 1988 election significantly simplifies such arguments.

This analysis leads me to define the objectives of my own work. Ideally, this thesis will, in one fell swoop, attempt all of the following: a replication of Zaller's results, confirmation the role of predispositions in regulating reception suggested by Smets and Isernia, an attempt to reckon with the lack of support for the RAS model found by Dobrzynska and Blais, and finally to fold in the continuous conceptualization of considerations suggested by Strauss. Zaller spends approximately fifty pages developing his model, and over two hundred pages generating and testing hypotheses and validating his work with different experiments. While this will not cover that much ground, nevertheless the point is clear that it is just as important to test the model rather than just evaluating it from its theoretical importance. In an ideal situation, we would have a dataset that provides us with all of the following:

- Data on an election where coverage is relatively balanced, of medium-to-high intensity, and somewhat unfamiliar

- Comes from a relatively recent election to analyze if the relative environment truly has shifted since the publication of *Mass Opinion*

- Contains multiple-wave sample of individuals, in order to test the dynamic model of attitude change and how people's opinions shift over time when encountering new information, testing the overall model structure

- Has information regarding individuals' opinion on a singular issue *and* what factors specifically come to mind when they reported that opinion, testing the sampling stage

- Includes data about respondents' predispositions and their level of political awareness, providing individual-level data to compare with reception and acceptance of messages

- Finally, allows testing of whether or not respondents had heard certain messages and whether they agreed with them or not, testing the reception and acceptance stages

Generally speaking, creating a dataset that asks questions to address all these points is an incredibly difficult task. Even if we subset this list to single-issue elections, finding a major election in the past 20-plus years that is based around only one issue is incredibly difficult. Further, acquiring the research funding and time to address all these questions with a representative and statistically meaningful sample is difficult enough to come by for a singular study, much less for a multiple-wave sample. This perhaps speaks to why there has been so little take-up of the RAS model: the data to do it seemingly does not exist. However, luckily enough, there does exist one dataset that I will argue satisfies nearly all conditions outlined in the above bulleted list and provides for a thorough analysis of the RAS and RAIS models.

4.2.1 Dataset In Context

In 2016, the United Kingdom held a referendum on its membership in the European Union, commonly referred to as "Brexit", a portmanteau of British and exit. Nearly 72% of eligible UK voters participated in the vote, indicating that a majority of UK voters had enough of an opinion to cast a vote, a shockingly high number for a major developed country. The referendum was also closely contested, with only a slight majority (appx. 52%) voting to leave the European Union (EU) (Chokshi et al. 2016). What makes the 2016 referendum relatively unique among recent elections in large countries is severalfold, and in order to analyze whether the Brexit referendum provides a suitable candidate for a test of both the RAS and RAIS model, I refer back to the three conditions just mentioned that were utilized in Zaller's work and that of Dobrzynska and Blais: *balance*, *familiarity*, and *intensity*. I will begin by discussing balance.

In an Oxford study of the media coverage of Brexit, Levy et al. show that among 9 major daily newspapers in Britain, approximately 40% of articles were biased in favor of the Leave campaign, approximately 30% were biased in favor of the Remain campaign, and the remaining 30% of articles took no position, took a mixed position, or were unclear or undecided about their position (Levy et al. 2016). In a media environment messages do not just come from the newspapers Zaller's model argues that they come from political elites as well. However, given that newspapers often are a vehicle for the delivery of content from political elites,

it is likely that at scale, the percentages are similar to these. While the percentages may not balance out precisely, we are clearly working with what Zaller would describe as a two-message model and one that is somewhat balanced, even if not perfectly so. Furthermore, analysis of the media environment conducted by Levy et al. is clear: elite messaging, as seen through newspapers, is polarized, which leads to a bidirectional message, as desired.

In terms of intensity, before the referendum campaign, the EU was a relatively low-salience issue (less than 1 in 10 voters named it as their most important issue) until the first few months of 2016, according to data from Ipsos polling (Fisher and Renwick 2018, 593). Notably, this was *three full years* after Conservative prime minister David Cameron had pledged to hold a referendum, suggesting that even though the issue had gained salience among elites, it was still of relatively low import and familiarity to the public. By August 2016, this skyrocketed to nearly 50% of all respondents. This single-issue dominance is a shockingly high number, considering the prominence of so many other issues. The fact that messaging surrounding Brexit was able to activate such importance suggests both a high-intensity campaign and suggests that the campaign's high-intensity was pervasive throughout the entire UK population. So clearly, this was an intense period in the media environment.

Finally, in terms of familiarity, an analysis by Fisher and Renwick of data from the British Election Study shows that on ten major issues[15], voters only claimed to be unfamiliar with the expected consequences about 10% of the time, which on the surface, suggests that the referendum campaign was familiar (Fisher and Renwick 2018, 600). Furthermore, the authors note that several consecutive party platforms from the UK's three largest parties (Labour, the Conservatives, and the Liberal Democrats) had all included verbiage on membership in the EU, and they write that it may seem that "the idea of a referendum on the EU was familiar and easy" (ibid. 593). However, the authors dig deeper, and in their results, show several factors that belie this data. First, the Ipsos polling cited above suggests that the campaign served as a means to activate the salience and import of an issue that, before the campaign, was not activated and hence unfamiliar. Further, as the authors continue, "Brexit was clearly an exceptionally salient issue, producing the highest turnout in a UK-wide vote for almost a quarter of a century" (ibid. 595). Hence, over the course of the campaign, the

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[15]Unemployment, international trade, immigration, terrorism risk, rights for British workers, the economy, one's personal finances, British influence abroad, the risk of big businesses leaving Britain, and the risk of Scottish independence

level of familiarity throughout the populace must have changed significantly–otherwise what would inspire such turnout on an issue that was so irrelevant (relative to the eventual importance it took on) before the campaign? Finally, and perhaps most importantly, voters may have *claimed* to be familiar with the issues, but when pressed on their expectations for Brexit, a majority of voters believed that things would either stay the same if Brexit happened or that they didn't know the consequences of Brexit (ibid. 600). The Oxford study cited above notes that over half the messaging utilized by the major newspapers throughout the campaign focused on factual discussion of Brexit and included many discussions about the potential consequences of the referendum (Levy et al. 2016). However, this finding is less clear than the others, and its consequences for analysis will be discussed soon.

On the whole, this analysis of evidence surrounding the intensity, balance, and familiarity of the Brexit campaign leads us to several conclusions. First, coverage was *mostly* balanced and undisputably intense. Issue familiarity, while more disputable, clearly seems to have evolved throughout the course of the campaign. Given all these factors, it is clear that exposition to messages throughout the campaign have a nonzero chance of changing peoples' minds, avoiding the potential for the inertial resistance problem defined in the literature review. Further, the balance and intensity of the campaign means that a wide swathe of people surveyed throughout the referendum campaign would be likely to report developing an attitude, or, for the more informed, potentially changing their mind. Thus, under the RAS and RAIS model, any evidence of attitude change must be due to the reception and acceptance of new considerations over the campaign. Due to all these factors, I believe that the Brexit campaign is ripe for an analysis of the RAS model (under the new information environment discussed in Chapters 2 and 3) and RAIS model. I turn now to a discussion of the dataset I have chosen and an exploration of the collectors' methodologies.

4.2.2 Data

The dataset for this thesis comes from Waves 7, 8, and 9 of the British Election Study (BES). Wave 7 sampled respondents from before the referendum campaign, Wave 8 sampled respondents during the campaign, and Wave 9 sampled respondents after the referendum. The BES contains 2,159 individuals who responded to all three waves of the study. I believe that the BES satisfies all the conditions outlined above, and will argue

those in order:

- As just shown, the 2016 referendum was relatively balanced, of medium-to-high intensity, and was unfamiliar enough to avoid the problem of inertial resistance, if not perfectly unfamiliar.

- 2016 is certainly recent enough to argue that the relative informational environment has potentially shifted since 1992.

- The BES does more than contain a multiple-wave sample of individuals; it contains a multiple-wave sample of *the same* individuals, which allows for a test of both individual-level and societal-level attitude change.

- The BES contains information regarding an individual's opinion on the referendum, but does not quite contain a mechanism for testing the sampling stage. I will discuss this later.

- The BES asks several questions about objective political awareness on the referendum and the EU, which goes above and beyond Zaller's hope for general political awareness. Further, it contains dozens of questions that can be used to construct an index of predispositions–allowing measurement of both predispositional mean and variance, as the RAIS model seeks.

- The BES asks about whether individuals have heard messages from specific parties or specific campaigns, but not about their agreement. However, it does include questions about the clarity of specific messages.

As the list makes clear, the BES is an incredibly valuable dataset to analyze the RAIS and RAS models. I will now set up several hypotheses to attempt to test both models.

4.2.3   Methods and Results

In order to adapt the theory and mathematical principals of the RAS and RAIS models into the questions of the BES study, I utilized a series of transformations and constructions, which I will briefly outline[16]. I began by constructing an index variable to define a measure of respondents' objective political awareness

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[16]I used the R programming language to create all code utilized for this thesis. Datasets and the R file utilized for this section, as well as the entire thesis, is available upon request.

surrounding the issue of Brexit and one's objective political predisposition. To create the awareness index variable, I utilize six true/false questions asked by the BES that test one's understanding of issues surrounding Brexit, including ones about EU membership, the EU's Common Agricultural Policy (CAP), and the judicial domain of the European Court of Human Rights (ECHR), all of which were central issues debated during the referendum campaign[17]. These questions, taken during Wave 7 of the BES, are assumed to be invariant throughout the campaign, by the necessary assumptions of the RAS model and RAIS model outlined above. I then standardize all the variables[18] before averaging their contributions. Figure 3 depicts the distribution of political awareness among respondents. Interestingly, political awareness appears to be approximately evenly and normally distributed in the population. This is incredibly useful for the regression assumptions, and perhaps paints a slightly more rosy picture of the populace than Zaller suggests is true.
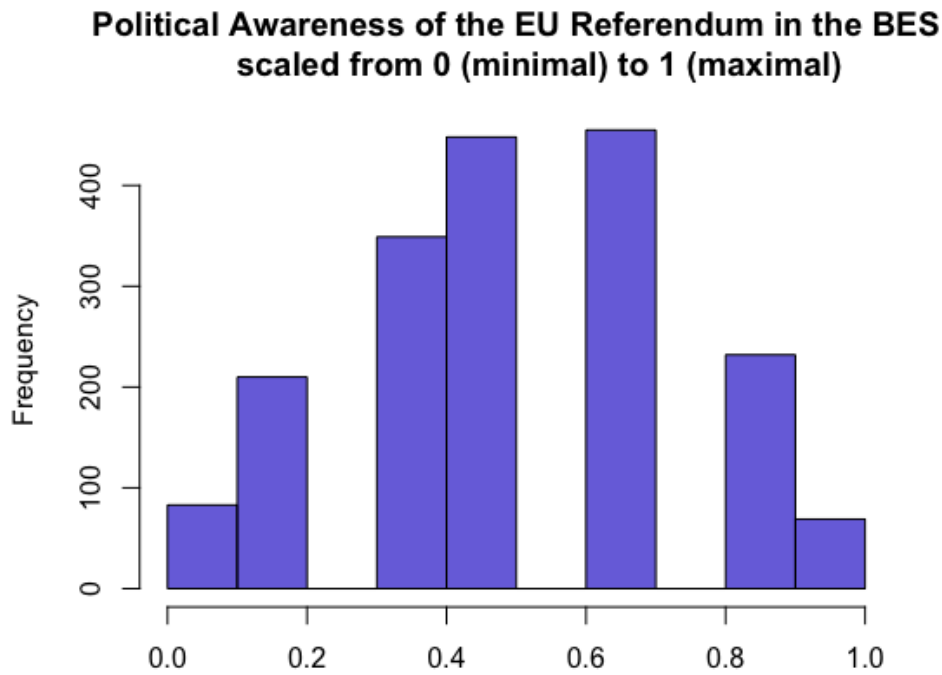

Figure 3: Histogram of Political Awareness among BES Respondents

Next, I attempt to capture an individual's predisposition on the issue of Brexit with a similar index

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[17]The full list of questions concerns whether or not Switzerland and Croatia are members in the EU, if countries have equal representation in the European Parliament, whether or not the EU spent a plurality of its budget on the CAP, whether the ECHR has domain over all EU countries, and whether or not the EU has more than 15 members

[18]That is, such that their mean is set at zero and a one-unit increase or decrease represents one standard deviation above or below the mean, respectively,

variable. I use an index composed of three variables that ask about one's self-satisfaction with EU democracy, one's self-rating of their skepticism of the EU, and one's opinion of whether or not a potential Brexit would lead to a better deal with the EU to define their predisposition. After filtering out those who did not respond to the questions, I again standardize the variables, but further rescale them so that those who answer in a more pro-EU fashion have a higher-valued response across all questions. Next, I combine the variables into a single index of ones' predisposition and standardize it so that a higher value is associated with a pro-Remain predisposition and a lower one is associated with a pro-Leave predisposition. Figure 4 shows the distribution of political predispositions among respondents.

Political Predispositions Among BES Respondents
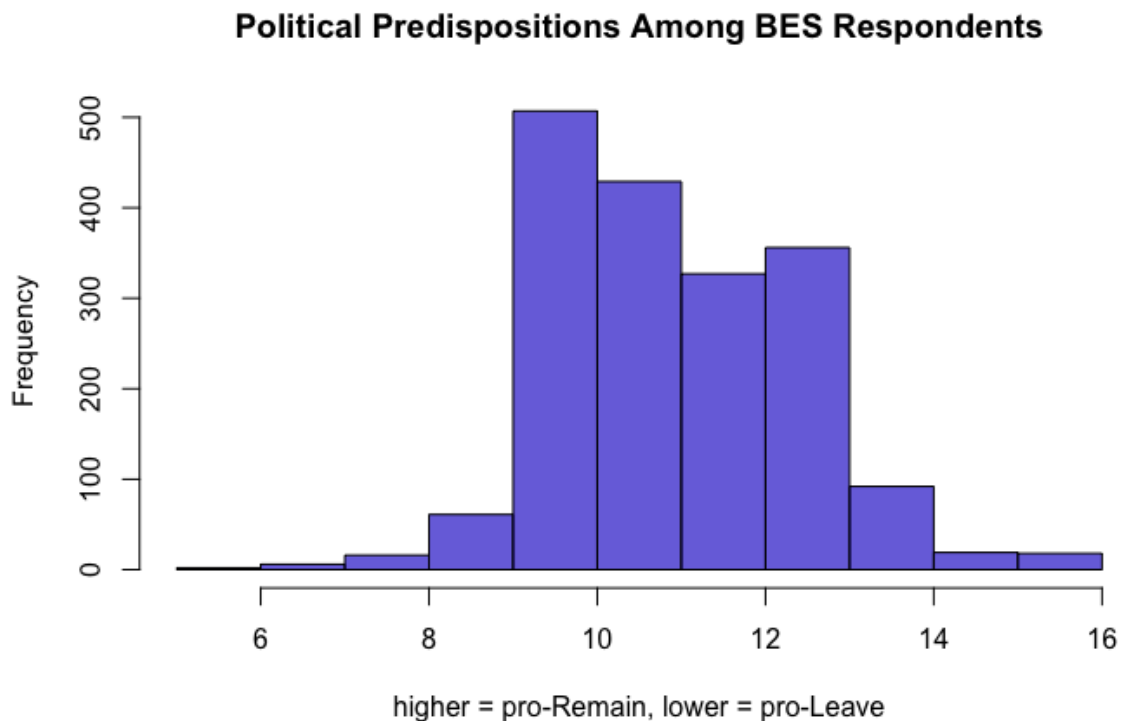
higher = pro-Remain, lower = pro-Leave

Figure 4: Histogram of Political Predispositions among BES Respondents

An analysis of this figure shows that political predispositions are approximately normally distributed throughout the population[19]. There is a slight increase in the number of respondents who have pro-Leave predispositions compared to those who are pro-Remain, but the distribution is tightly clustered around the mean. The above analysis of the messaging environment suggests that there is a relatively even split between

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[19]Due to non-standard scaling across variables, the units of this metric are irrelevant. This image should be analyzed in terms of the distribution and not in terms of the units.

elite messages that support the Leave side (with a slight advantage in terms of pro-Leave elite messaging) and the Remain side, and hence we expect that this is reflected in peoples' reported predispositions as well. The data validates this assumption, with a slight increase in those who are moderately pro-Leave compared to moderately pro-Remain. With the variables of interest so constructed, let us them move onward to the two portions of interest: the reception and acceptance stages.

At the reception stage, recall from the literature review that Dobrzynska and Blais had to make do with imprecise data and defined reception of a message as *understanding* of a message–whether survey respondents accurately identified a party's platform. The BES data directly asks questions about whether a survey-taker has received messages at all *and* if they have received any messages at all that are pro-Leave or pro-Remain, which allows a more precise test of the reception steps of the RAS and RAIS model. I create three hypotheses surrounding reception of messages, with the goal of testing the RAS and RAIS models, along with understanding the role of awareness as a potential accuracy motivation.

My first hypothesis, **H1A**, is that **the more highly aware are more likely to have received messages surrounding the referendum**. This is a simple test of Zaller's Reception Axiom. I expect that those with higher objective political awareness are more likely to have received messages surrounding the referendum. Of note, approximately 98% of respondents report reception of any message at all.

To test the RAIS model, I construct my second hypothesis, **H1B**. H1B is that **the more highly aware are more likely to have received messages that are in line with their predispositions**. This hypothesis tests the RAIS model's first axiom, about the interaction effect between predispositions and awareness at the reception stage. Since I am working with three variables (predispositions, awareness, and their interaction), I'll briefly outline my hypotheses about each. Firstly, the RAIS model and the RAS model both expect that the marginal effect of political awareness[20] will be an increase in the probability of receiving cogenial communications. Similarly, I expect that the marginal effect of the strength of one's political predispositions[21] will be an increase in the probability of receiving cogenial communications.

To achieve this in one step, I create a variable I term "predispositional strength", which I calculate as $P_s = (\mu_{ji} - \mu_i)^2$. Recall that μ_{ji} is defined as the mean of an individual j's predisposition on issue i. In this

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[20]the effect of a one-unit increase in political awareness, holding political predispositions constant

[21]the effect of a one-unit increase or decrease in one's predisposition

case, μ_i represents the mean of the population predisposition. Taking this difference and then squaring it effectively constructs a Euclidean distance metric representing how far away an individual's predisposition is from the mean, with a higher number suggesting a "stronger" predisposition and a smaller one suggesting a "weaker" one, regardless of if a predisposition is more pro-Leave or pro-Remain. Having constructed this variable, I thus expect the joint effect[22] of predispositional strength and political awareness to be an increase in the probability of receiving cogenial messages.

Finally, my last hypothesis surrounding reception, **H1C**, is that **the more highly aware are more likely to have received uncogenial messages, meaning those that are not in line with their predispositions.** This hypothesis focuses more on motivated reasoning, supposing that objective political awareness acts almost as an "accuracy motivation" to cause people to encounter–whether consciously or unconsciously–uncogenial messages.

To test my hypotheses about the reception stage, I run three separate regression models, one for each hypothesis. For the first hypothesis, I create a variable that aggregates across the many questions asked about reception of messages concerning the EU, scored as 1 if they received any message concerning the referendum and 0 if they did not receive any messages. For the second and third hypotheses, I construct variables about respondents' reception of cogenial or uncogenial messages. If a respondent's predisposition is pro-Remain and they receive a pro-Remain message across any of the three waves (and the same for a pro-Leave predisposition and a pro-Leave message), they are scored as having received a cogenial message. Similarly, if a respondent's predisposition is pro-Remain and they receive a pro-Leave message (or vice versa), they are scored as having received an uncogenial message.

A review of Table 1 yields support for **H1A** and **H1C**. Model 1 clearly provides support for the reception of all messages under the RAS model: an increase in political awareness strongly shows an increase in the probability of receiving a message surrounding the referendum. And, while Model 3 and H1C do not explicitly test the RAS or RAIS models, it does show that political awareness is also associated with reception of uncogenial messages. This arguably suggests that awareness serves as a measure of an "accuracy motivation": individuals with higher awareness, whether consciously or unconsciously, come into contact

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[22]the effect of a one-unit increase in both political awareness *and* the strength of one's political predispositions

Table 1: Models of Message Reception under the RAS and RAIS Models

	Dependent variable:		
	$\mathbb{P}$(Receive any communications)	$\mathbb{P}$(Receive cogenial communications)	$\mathbb{P}$(Receive uncogenial communications)
	logistic	_logistic_	_logistic_
	(1)	(2)	(3)
Political Awareness	3.759***	0.814***	0.166***
	(0.758)	(0.244)	(0.046)
Strength of Predisposition		0.051*	
		(0.031)	
Political Awareness * Strength of Predisposition		0.053	
		(0.056)	
Constant	2.529***	−1.312***	0.429***
	(0.280)	(0.140)	(0.025)
Observations	1,956	1,956	1,956
R^2			0.007
Adjusted R^2			0.006
Log Likelihood	−161.722	−1,189.839	
Akaike Inf. Crit.	327.443	2,387.679	
Residual Std. Error			0.498 (df = 1954)
F Statistic			13.277*** (df = 1; 1954)

Note: *p<0.1; **p<0.05; ***p<0.01

with more messages from the side against their predisposition.

An analysis of **H1B** through Model 2 requires a slightly more nuanced inquiry. The marginal effects of both political awareness and predispositional strength are positive and significant, as expected, suggesting that increases in political awareness and predispositional strength (holding the other term constant) promotes reception of cogenial messages. The interaction term between political awareness and predispositions has a positive sign but has a high standard error, leading to that term escaping statistical significance. Clearly, one's predispositional strength is important in receiving messages. However, as specified, H1B is not supported, as it is not the case that predispositional strength and political awareness have a multiplicative effect on the probability of receiving a cogenial message. Thus, while the variables are clearly both relevant and meaningful, the functional form of the equation specified is not. A further investigation of this finding will be taken up in the Discussion section.

From this analysis, it is clear that at the reception stage, the RAS and, to a lesser extent, the RAIS models are supported: political awareness _and_ political predispositions impact the messages one receives. This confirms the hypotheses of Smets and Isernia and the basic tenets of the RAIS model.This conflicts with the crucial finding of Dobrzynska and Blais, who found that, while political awareness increases the probability of reception, political predispositions were not correlated with reception of messages (Dobrzynska and Blais 1992, 266). Clearly, we can accept the basic hypotheses that political awareness leads to greater

reception of messages both in line with and against one's predisposition, and that one's predisposition additionally impacts reception of cogenial messages.

Next, I aim to test the acceptance stage of Zaller's model. Recall that, again, $\mathbb{P}(\text{Change}) = \mathbb{P}(\text{Accept} \mid \text{Receive}) \cdot \mathbb{P}(\text{Receive})$. If we assume that an individual has received a message, we can then note that $\mathbb{P}(\text{Change}) = \mathbb{P}(\text{Accept})$, because $\mathbb{P}(\text{Receive}) = 1$, and since that event is assumed to have happened, the right-hand side of the equation simplifies to $\mathbb{P}(\text{Accept})$. This allows an analysis specifically of $\mathbb{P}(\text{Accept})$, focusing on a more measurable aspect, $\mathbb{P}(\text{Change})$[23]. To do this, I subset the BES to only those who changed their vote intention over the course of the campaign, since a specific test at the large-scale of whether or not a voter accepts a message is impossible[24]. By both the RAS and RAIS models, this must be due to accepting enough messages to change their reported opinion. Recalling again from Zaller and from the analysis above, in a situation where individuals have accepted many messages already, we are faced with the "inertial resistance problem", where individuals may accept many messages without changing their attitude due to a large store of preexisting considerations. I further break down the dataset into two cases: those who change their minds from Leave to Remain, and those who change their minds from Remain to Leave. Despite the breadth and depth of the BES dataset, there are only 13 individuals who report changing their vote or vote intention from Remain to Leave. As a result, I chose to exclude this group of voters from analysis, as I felt that a sample size of $n = 13$ was far too few cases to draw any meaningful conclusions from. I thus focus the remainder of my analysis on attitude change on voters who changed their votes from Leave to Remain over the course of the campaign; the dependent variable is thus whether or not one changed their vote from Leave to Remain over the campaign.

As a result, I had to make one more variable-oriented transformation. Since the expected value of a draw from the predispositional distribution is the mean of the distribution, we can use an individuals' predisposition (as defined above) to define that. However, to define an individual's predispositional variance requires a little bit more work. The BES asks respondents a question about how clear they find both the pro-Leave and pro-Remain messages to be. While the wording of the question is slightly unclear[25], it can be understood as

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[23]Note that this necessarily assumes that $\mathbb{P}(\text{Accept}) = \mathbb{P}(\text{Change})$. This is only true in a select few circumstances, however, it is a necessary adjustment, and I believe, a plausible one.

[24]see Druckman et al. (2012), for example, on small-scale experiments that test whether an individual has accepted a message

[25]Respondents may understand the question as asking whether the individual messages from the Leave and Remain campaigns are clear or whether the aggregate messages from the campaigns are clear

a useful proxy for the σ_i term in the RAIS model; that is, the variance of the distribution. However, since we are working with individuals who have shifted their vote from leave to remain, I slightly alter this and define the measure of predispositional variance as the difference between an individual's perceived clarity of the Remain campaign and that individual's perceived clarity of the Leave campaign[26].

There are two (three) key independent variables in the acceptance stage of the RAS (RAIS) model: awareness, predisposition, and for the RAIS model, the relative message clarity. Unfortunately, unlike the reception step, we are no longer working with models of general acceptance of messages, but rather of the (assumed) acceptance of messages that are specifically pro-Remain. As a result, we must create all our hypotheses in that context, which requires a more nuanced setup. Additionally, unlike the previous hypotheses where expectations were clearly derived from theory and immediately visible in the results of the regressions, the results of these hypotheses will be more easily visible when the model's predicted probabilities are displayed in graphical form.

To begin creating hypotheses about attitude change, I will start with political awareness. Recall from the literature review that the effect of awareness differs across pro-Leavers, moderates, and pro-Leavers. Hence, when creating these hypotheses, it is difficult to create an expectation of the sign on the regression coefficient of political awareness. Furthermore, as there was no consensus among elites or on the messaging surrounding the referendum (as demonstrated in the above media analysis), those with higher awareness are not expected to be more pro-Remain or pro-Leave per se. This is due to the fact that, for the purposes of substantively testing the RAS and RAIS models, we are interested in how the variables interact rather than their marginal effects. For both the RAS and RAIS models, we expect that the marginal effect of political awareness will be significant, and that its sign will be negative. This follows directly from Zaller: generally speaking, if people are more highly politically aware, they should be expected to have already internalized more considerations matching their predispositions, and hence less likely to change their mind. The phrase "generally speaking" performs a significant amount of theoretical work in this case. For example, as established by Zaller, we expect that the highest-aware pro-Remainers will in fact be more likely to change their mind to be pro-Remain than a less-aware pro-Remainer. While their overall probability of initially *not*

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[26]In a more generalized study of attitude change, perhaps it would be ideal to utilize the clarity of just one campaign.

being pro-Remain is low, if they do fall into that category, then we expect them to be very likely to change their mind.

Next comes the effect of political predispositions. Let's begin with a short example to illustrate the expected regression coefficient and why that coefficient does not have substantive bearing on the meaning of the results. Generally, we expect that if one has a predisposition closer towards the Remain side, they will have a higher probability of accepting a pro-Remain message; this again follows naturally from the RAS model. However, as discussed, the regression that will be displayed operationalizes the probability of acceptance as equal to the probability of change. This unfortunate but necessary transformation means that, for our pro-Remainer, we expect their probability of change to be lessened. This is because, if their awareness is high, they should be more likely to support the Remain side already and thus have a lower probability of attitude change towards the Remain side. Further, if their awareness is low, we expect them to be more likely to shift their opinion; because acceptance is contingent upon reception, in the event that a person with a pro-Remain predisposition receives a pro-Remain message, they are likely be able to realize the message is in line with their predisposition and change their mind.

That dense, wonky, and complicated example can be summarized as follows: we expect a negative coefficient on political predispositions, but that when we analyze the model's actual predictions of attitude change, the predicted probabilities of attitude change should be different across groups and hence we cannot necessarily infer those results from the regression coefficient.

Next, the interaction between these two variables of predisposition and awareness is the primary focus of the RAS model, which predicts a non-monotonic interaction between these variables. In this specific situation, I expect that the sign of the interaction will be positive. Abstractly, this suggests that a joint increase in both political predispositions and political awareness leads to an increase in the probability of attitude change. Specifically from the point of view of the RAS and RAIS models, this joint increase suggests that for individuals whose political awareness is higher and predisposition is more pro-Remain, they will be more likely to change their attitude. This is due to the fact that since they are pro-Remain with higher political awareness, they will be able to internalize cogenial considerations and hence more likely to switch their opinion. Similarly, for individuals whose political awareness is lower and whose predisposition is more

pro-Leave, they will be less likely to change their opinion to a pro-Remain one for inverse reasons.

In terms of the RAIS model, I expect all of the above variables and coefficients to be the same; however, we also include a term for the perceived relative clarity of the Remain message. In terms of the marginal effect of the clarity term, I expect that individuals who perceive the Remain message as more clear than the Leave message will, all else equal, be more likely to switch from Leave to Remain, and by the RAIS model, this effect will work in tandem with political awareness and predispositions. Unlike political awareness, I expect this effect to be independent of predispositions; if one is pro-Leave and perceives the Remain message as having a more clear display of its intentions than the Leave message, we still expect it to increase the probability of acceptance.

There is one more variable of interest in the RAIS model: the hypothesized triple interaction between message clarity, one's political predisposition, and one's political awareness. Utilizing similar reasoning to the RAS model above, I expect the sign on this coefficient to be positive. Again, this suggests that a threefold joint increase in the relative clarity of the Remain message, one's predisposition, and one's political awareness should lead to a higher probability of attitude change towards the Remain side, which follows clearly from the RAIS model. When specifying a regression with three potential interacting terms, all combinations of the three will report coefficients and significance. However, of the double interactions (predispositions and awareness, predispositions and clarity, awareness and clarity), the RAIS model is only concerned with the interaction of predispositions and awareness, which follows from the RAS model.

With all of these cautionary statements and caveats noted, I now move to test these expectations through the creation of specific hypotheses. To test the RAS model, I create hypothesis **H2A**: **political awareness and predispositions jointly work together to influence the probability of attitude change.** This will the RAS model's second axiom, about the "acceptance" step, and will further test the RAS model's prediction of non-monotonicity. I expect to confirm Zaller's work and find that higher political awareness is associated with attitude change, and that the interaction between predispositions and awareness will lessen the probability of attitude change against messages from the other side. To then test the RAIS model's hypothesis about including the relative clarity of a message, I create hypothesis **H2B**: **political awareness, predispositions, and a message's clarity jointly work together to influence the probability of**

attitude change. This tests the RAIS model's acceptance step, and includes the BES dataset's information on how informational a campaign's messaging was. For this hypothesis, I expect to find the same results as H2A, but with the added caveat that a more informational campaign will lead to a higher probability of attitude change. The results of models that estimate these hypotheses are displayed in Table 2. As mentioned, I caution that the reader should refrain from reading too deeply into the regression tables; recall above that an analysis of predicted probabilities will be crucial in understanding how these models function[27].

An analysis of the significance and regression coefficients listed in Model 4 yields significant support for the RAS model as outlined above. The coefficient on political awareness is negative and significant, suggesting that, holding political predispositions constant, individuals who are more politically aware are less likely to switch to be pro-Remain. The coefficient on political predispositions is also negative and significant, suggesting that those who are pro-Remain. Finally, the interaction between political awareness and political predispositions is positive and significant, suggesting that, as expected, a joint rise in innate Remain support and political awareness makes one more likely to change their vote to be pro-Remain. Moving on, an analysis of Model 5 shows support for the RAIS model's predictions about the clarity of messages, though not exactly as **H2B** predicts. All three of the marginal effects of awareness, predispositions, and message clarity are significant and have coefficients in the expected directions. Furthermore, the interaction term between awareness and predispositions is still significant and positive, suggesting that the RAIS model builds on the RAS model as hypothesized. An additional analysis of the relative lack of change of the coefficients of political predispositions and political awareness, along with the log-likelihood, shows that the inclusion of the relative clarity of the Remain message enhances the model's fit. The other important variable in Model 5 was the hypothesized triple interaction, where a message's clarity, one's predispositions, and one's awareness were believed to work together to influence attitude change. This variable barely escapes significance, though its sign is positive as expected. In both models of attitude change and models of the reception of messages, all the variables that were crucial to the RAIS model achieve significance through their marginal effects, though their interactions do not retain statistical significance; similarly, this is by a small margin. This

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[27]When reading the marginal effects in the table, note that each marginal effect (that is, the coefficients of political awareness, political predisposition, and the relative clarity of the remain message) represents the effect of that independent variable *holding the other independent variables constant at zero*. This requires a more nuanced understanding than a standard regression table, and provides another reason to focus on the graphs of predicted probabilities, which will be much more interpretable.

Table 2: Models of Attitude Change

	Dependent variable:	
	$\mathbb{P}$(Change from Leave to Remain)	
	(1)	(2)
Political Awareness	−9.994**	−9.658**
	(3.964)	(4.289)
Political Predisposition	−0.444**	−0.501**
	(0.206)	(0.212)
Relative Clarity of Remain Message		3.412*
		(1.776)
Awareness * Predisposition	0.899***	0.910**
	(0.347)	(0.373)
Political Awareness * Rel. Remain Clarity		−4.580
		(3.096)
Predisposition * Rel. Remain Clarity		−0.253
		(0.157)
Awareness * Predisposition * Rel. Remain Clarity		0.398
		(0.273)
Constant	2.373	3.237
	(2.296)	(2.363)
Observations	917	917
Log Likelihood	−241.338	−221.798
Akaike Inf. Crit.	490.676	459.595
Note:	*p<0.1; **p<0.05; ***p<0.01	

suggests that the basic hypotheses of the model are correct, even if the functional form I have specified is not entirely accurate. A further analysis of this finding will be presented in the Discussion section.

With the creation of Models 4 and 5, an analysis of the predicted probabilities of information reception and attitude change is possible; as discussed, this will allow for a further understanding of how attitude change functions under both the RAS and RAIS models. First, I will present predicted probabilities of message reception and attitude change under the RAS model. To do this, I utilized Models 1 and 4 to compute the predicted probabilities of message reception among respondents with pro-Leave, pro-Remain, and centrist predispositions, and further subsetted those results out by their level of political awareness. I then repeated this process to determine the predicted probabilities of attitude change from a Leave vote to a Remain vote[28]. These predicted probabilities are displayed in Figure 5.
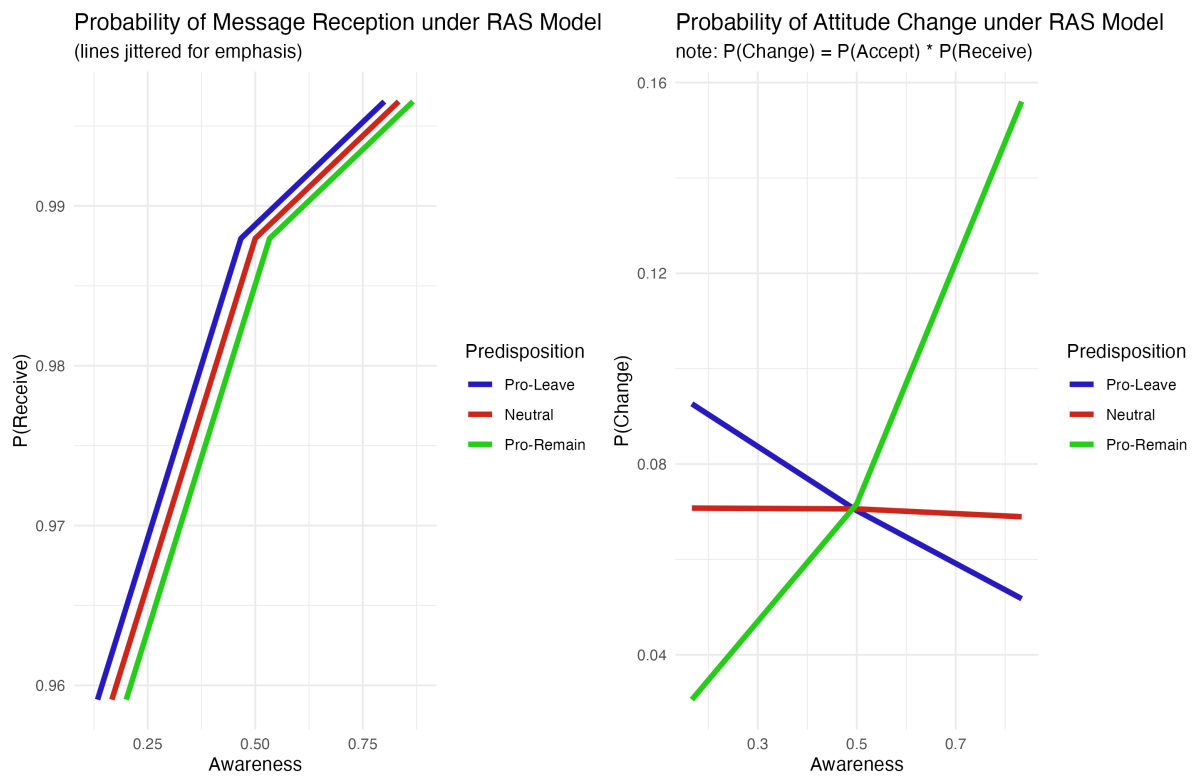

Figure 5: Predicted Probabilities of Message Reception and Attitude Change under the RAS Model

Two things are notable from these graphs. First and foremost, the Reception Axiom of Zaller's model is, as is evident in the description of the logistic above, highly supported. As political awareness increases,

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[28]To achieve this, I created imaginary respondents at the 10th, 50th, and 90th percentiles of awareness, predispositions, and perceived message clarity, where a higher-percentile predisposition represents a more pro-Remain predisposition

respondents are much more likely to receive a message. Perhaps most notable is the fact that even the least aware have an incredibly high chance of receiving any message at all; this will be analyzed more in the Discussion section. Of further note is the probability of attitude change among the lowest aware. As will be additionally mentioned in the Discussion section, we notice linear effects for each of the individual predispositions in a way that would seem to run counter to the predictions of the RAS model. For now, suffice it to say that the predicted probabilities of attitude change that follow from the RAS model are worth of a further analysis and one cannot simply accept the regression coefficients or significance thereof uncritically.

Next, I utilized I used Model 2 and Model 5 to compute the predicted probabilities of the reception of cogenial messages and attitude change, respectively, under the RAIS model. Again, the predicted probabilities of attitude change depicts the probability of switching from a Leave vote to a Remain vote among respondents with pro-Leave, pro-Remain, and centrist predispositions, with those results further subsetted out by their level of political awareness; these graphs also are divided by the respondent's opinion of the clarity of the Remain message over the Leave message[29]. I display the results in Figure 6.
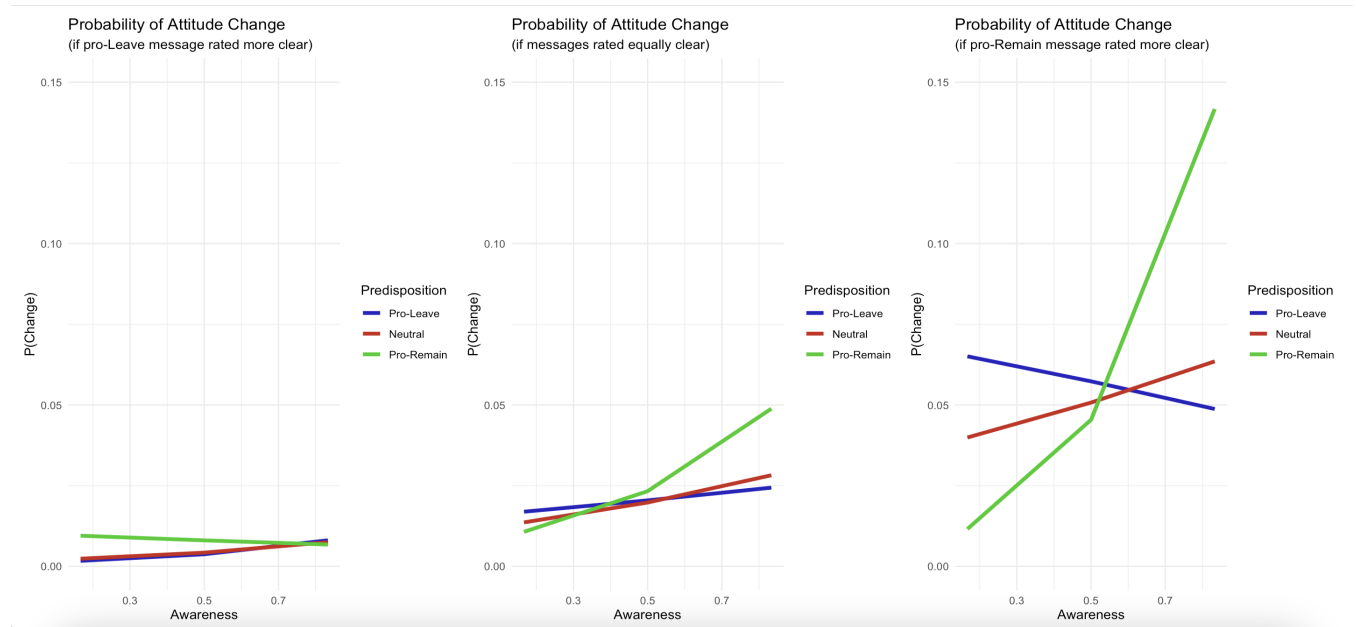

Figure 6: Predicted Probabilities of Attitude Change under the RAIS Model

[29]To achieve this, I created fake respondents at the 10th, 50th, and 90th percentile of awareness, predispositions, and perceived message clarity, where a higher-percentile predisposition represents a more pro-Remain predisposition and a higher-percentile clarity represents a respondent rating the Remain message significantly more clear than the Leave message.

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Each graph in Figure 6 is worthy of discussion. A general analysis of all three graphs shows that, despite what the regression tables showed, the effects of awareness and predisposition are conditional upon perceptions of the relative clarity of the Remain message. The specific interactions may not have achieved statistical significance, but a review of the model's predictions shows that, depending on one's perceived clarity of the Remain message, there are hugely substantive effects on their probability of attitude change, effects that vary widely across levels of perceived clarity. Furthermore, one of Zaller's major contributions was his expectation of non-monotonicity by predisposition, which would be expected to show up in the predicted probabilities outputted by the RAIS model as well. However, as seen in the predicted probabilities of the RAS model in Figure 4, we do not find any non-monotonic predicted trends for any of the three graphs. Additionally, as discussed in the hypotheses, understanding how marginal effects work in the presence of hypothesized interactions is difficult. It may seem that, from the regression coefficients, significance (or lack thereof), and signs, that these effects are unforeseen and therefore that there is inconsistency between the regression table and the predicted probabilities. However, when reading a regression table in the presence of interactions, recall that the interaction effects represent the effect of a one-unit change in the variables of interest holding the other variables constant at zero. As a result, these regression coefficients and signs (as discussed) are much less useful for analysis than these graphs of the predicted probabilities of attitude change.

Moving on to a specific analysis of the figure, the left-hand graph (which represents those who believed that the Leave message was much more clear than the Remain message) shows that even for pro-Remainers with a high level of political awareness, if they perceive a lack of clarity in the Remain message, they are unlikely to switch their vote. This is likely due to the fact that, as hypothesized in Chapter 3, a message that does not declare its position strongly (and hence, from a probabilistic view, has a high standard deviation about its mean) comes with a high degree of uncertainty. Therefor, for a pro-Remainer, even if they accept the pro-Remain message, due to its uncertainty, it may well be accepted as a pro-Leave message and therefore lower the probability of attitude change towards Remain.

Interestingly, when the messages are rated equally clear (in the middle graph), all levels of predispositions exhibit an increase in the probability of attitude change as awareness increases. For the lowest aware,

the probability of change is slightly higher for pro-Leavers and centrists, suggesting that the effect of low awareness (as Zaller hypothesized) is that these people are unable to see that the message is inconsistent with their predisposition and thus uncritically accept the message and change their mind. As awareness rises, we again see the expected trend, where pro-Remainers are more likely to accept a message and then change their mind than centrists, who are more likely than pro-Leavers to do the same. Again, this follows clearly from the theory behind the RAS and suggests that the RAS and RAIS models are grounded in similar theory.

Finally, the right-hand graph (where the pro-Remain message is rated more clear than the pro-Leave message), we begin to see a series of interesting results. The graph now resembles the pattern of attitude change seen under the RAS model, with a slight variation among the moderately aware. However, the linear effects by predisposition still persist.

5 Discussion

"Political scientists have no pride. They'll use anything that works. Or doesn't work—it's not like they would know." -Andrew Gelman

The goal of the previous section was threefold. Firstly, I aimed to perform an evaluation of the RAS model under a new informational environment. Secondly, I aimed to reckon with the results of Dobrzynska and Blais and Smets and Isernia, who found a critical lack of support for the RAS model. Finally, the overall goal of this thesis was to consider new possibilities of the RAS model in a different informational environment and utilizing a more mathematically rigorous approach. In this chapter, I'll analyze the results of my analysis as it pertains to these goals.

With regard to the first goal of my analysis, the RAS model holds up remarkably well. There is clear and significant support for Zaller's first and second axioms, about the impact of political awareness on the reception and acceptance of political messages. At the reception stage, as Zaller predicts, political awareness is significant and is positively correlated with the reception of messages. Additionally, political awareness functions this way for both cogenial and uncogenial messages, suggesting that it effectively serves as an "accuracy motivation" as defined in the motivated reasoning theory that undergirds *The Nature and Origins of Mass Opinion*. As discussed in Section 2.2, the psychological grounding of the RAS model, it may seem that the indeterminate nature of the background psychological processes that drive motivated reasoning may conflict with Zaller's model, but this thesis clearly shows that they do not. Next, at the acceptance stage, both political awareness and political predispositions clearly affect the acceptance of messages in the non-monotonic functional form that he expects. Additionally, when I specifically tested the probability of change under the RAS model, the critical interaction between political awareness and political predispositions was significant and had a sign in the expected direction, supporting Zaller's theory of the two-step reception-acceptance model and his reasoning around the joint effects of one's awareness and predisposition.

Notably, I did not test the *sample* stage of the RAS model, which may seem like an oversight to readers of this thesis. However, Zaller's major contribution with regard to the sample stage is his analysis of the idea of response error, which was discussed in Chapter 4.1 above. His analysis is so widely accepted by the community from a theory perspective and has been incredibly well established as an environment-invariant

fact time and time again. He cites a bevy of cross-disciplinary sources, runs many experiments, and there exists a broad range of literature both as of his writing and the present day. Hence, I do not think it necessary to run experiments confirming this finding[30]. The results clearly show that the RAS model's conclusions resonate backwards and forwards in time and hold regardless of the media environment.

Next, with regard to my own analysis and my creation of the RAIS model, the conclusions are mostly positive, with room for improvement. At the core of the RAIS model was an argument that Zaller's thesis on selective reception–that is, that individuals' predispositions do not affect their reception of messages–is no longer accurate in today's media environment. This argument is clearly supported by the BES data, where a stronger political predisposition was unequivocally shown to impact one's reception of messages similar to that predisposition. One's political predisposition clearly affects–whether consciously or unconsciously–the messages they receive. This can happen due to outside sources, such as a targeted Facebook ad, or from personal choices, such as pro-Remain voters flocking to pro-Remain content and ignoring pro-Leave voices. Furthermore, the crucial mean-variance argument of the RAIS that suggested that the clarity of a message impacted not just *if* a message was accepted, but *how* it was accepted was supported. This, unlike Zaller, paints a picture of citizens who are not just uncritical thinkers, internalizing the messages they accept; there is in fact internal variance between how people perceive messages. There are many potential reasons that a citizen may perceive a message as more or less clear. Perhaps a party platform is inconsistent or tries to explicitly lie to a citizen in an attempt to persuade. Or, perhaps, there are other factors (outside the scope of this thesis) that cause one person to perceive a message as more or less clear than another. Regardless of whether this is conscious or unconscious, the fact remains that much work can be done to explore the impact of what makes a message more or less clear, which can in turn continue to shed light on why a message is accepted in the specific fashion it is.

The specifics of how I articulated the functions that define p_r and p_a, the probability of receiving and accepting a message, did not bear fruit. However, the broader theories that I grounded them in were supported. It is clear that one's predisposition works along with one's political awareness to impacts the message they receive, and further, a message's position and how strongly it declares that position are both

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[30]As a sample of the many experiments confirming this finding, its ubiquity in poll explainers, and its reception in mainstream media, see Rothschild and Goel 2016; Kruttschnitt, Kalsbeek, and House 2014, citing Tourangeau, Rips, and Rasinski 2000, Schwarz 1996, and many others; and Celhay, Meyer, and Mittag 2022.

critical in the acceptance and internalization process. What is less clear is the exact nature of the functional form by which these processes work together. The fact that I found the effects of these factors to be additive in their nature and not multiplicative is interesting and worthy of future research to examine and theorize about how those factors work together, even if they do not interact in the modeling sense. More research, across other datasets and media environments, is necessary to see if this finding is unique to the Brexit referendum or if there is another relationship by which the two variables work together. Furthermore, the results of this thesis suggest that it is not just a message's mean, but also its standard deviation, that impacts how a message is understood and thus integrated. Hence, there is support for an understanding of both messages and opinions as a continuous distribution rather than a binary pro-against framework. I was unable to test the exact Beta-Binomial updating process that I suggested in Chapter 3, but as affirmed by Strauss (2008) whose normal-normal framework (as discussed) also includes an update through Bayes' Rule, there is significant support both empirically and theoretically for this argument.

A comparison of the RAS and RAIS models from this empirical perspective further reveals that the information environment has shifted substantially–another crucial result of this thesis–and shows that this shift is not just due to the selective reception hypothesis. Despite the fact that his hypothesis on selective reception is no longer accurate, I argue that this still provides support for Zaller's model. At the reception stage, recall how, in Figure 2 (Zaller's example of the probabilities of reception), one's probability of message reception monotonically increased with their political awareness. However, the least aware had only a 10% change of receiving a message. As evidenced in Figure 5 (the RAS model's predictions of message reception from the BES), this monotonic increase still holds. But, recall again the RAS model's predictions under the BES dataset: the least aware had nearly a 96% chance of message reception, a *huge* increase compared to Zaller's hypothetical from 1992. It is inarguably true that, as Zaller hypothesizes, the intensity of a campaign is inextricably linked to message reception (Zaller 1992, 155-157). However, there were plenty of intense campaigns before the contemporary era of politics, and it is unlikely that Brexit has eclipsed them all in terms of intensity. Hence, I think it likely that there has been a substantial shift in the number of people who receive political messages, due to a number of exogenous variables, as intensity alone cannot explain this enormous shift in the probabilities of the least aware receiving messages.

Next, at the acceptance stage, the graphs of predicted probabilities of acceptance under both the RAS and the RAIS models have the same functional form that was hypothesized in *The Nature and Origins of Mass Opinion*, which suggests that the back-end factors that undergird the RAS model's definition of acceptance have not changed. Hence, the differences in the predicted probabilities of attitude change are likely to be substantially related to the shift in the informational environment brought upon by selective reception and other exogenous increases in the ways by which people engage in politics.

This finding, to me, *supports* Zaller's theory and model rather than casting doubt on it. As mentioned in the literature review and the development of the RAIS model, his hypothesis about non-selective reception is just that: a hypothesis. The fact that all of his major takeaways still hold true, with what is a relatively small alteration to the theory, suggests that the RAS model is flexible enough to incorporate these shifts in the nature of political discourse. In creating such a flexible model, one where the basic hypotheses can change over time and maintain results, I argue that this lends incredible credence to *Mass Opinion.*

All of these positive takeaways aside, there are several important assumptions and caveats in this thesis that are worthy of analysis. Recall that due to sample size issues with voters who changed their mind from Remain to Leave, I focused my analysis solely on those who switched from Leave to Remain. The typologies of attitude change expressed within this sub-group of respondents held true to the expectations of the RAS and RAIS models, but recall that these models focused their theories on attitude change in general, not just on a subset of the population. In an ideal situation, we would have a much larger dataset of people whose minds had changed and analyzed total attitude change rather than just from Leave to Remain. The fact that there was such a difference between the numbers of people switching to Leave and switching to Remain is interesting, especially considering that, as discussed, the overall media environment was slightly pro-Leave. Furthermore, we are not given specific information on the reception of multiple messages; forced to make do with questions that ask only about reception or non-reception of a particular message, we are unable to determine exactly how the relative balance of considerations changes, only whether or not it has changed.

Next, astute readers of Zaller (or of this thesis) may notice that the patterns of attitude change under the RAS and RAIS model do not agree to Zaller's expectations. As discussed, Zaller expects a non-monotonic pattern of attitude change by predisposition. In every single graph of predicted probabilities, I instead found

a monotonic trend. This comes down to two factors.

First, recall that the probability of change under the RAS and RAIS models was operationalized as

$$\mathbb{P}(\text{Change}) = \mathbb{P}(\text{Accept}) \cdot \mathbb{P}(\text{Receive})$$

due to the fact that the dataset does not contain specific information on the acceptance of messages. But, as discussed, it is clear that the probability of receiving a message for people of all predispositions(regardless of their political awareness) is incredibly high. When contrasted with Figure 2 (Zaller's table of attitude change probabilities), this shows that the change in the expected probability of attitude change has come not from the acceptance stage, but rather from the reception stage. Hence, the non-monotonicity seen in these results suggests a shift in the media environment and an increase in the ways in which individuals engage with politics, not a broader shift away from the theory.

Secondly, the patterns of attitude change must be understood in the context of message intensity and issue familiarity. Since different levels of intensity and familiarity, as mentioned in the literature review, affect reception and acceptance (by changing the media environment), different levels of intensity and familiarity lead to different patterns of attitude change (Zaller 1992, 154-157). Specifically, higher message intensity interacts with reception (as a more intense message is more likely to be received; see the above analysis of the Brexit media environment) and higher message familiarity interacts with acceptance (as a more familiar message leads to the inertial resistance problem, also analyzed above) (ibid. 153-155). Zaller utilizes this fact to create a model to examine the "persuasive impact" of a liberal message based on varying values of message familiarity and intensity. The model is presented in Figure 7. Six regions are identified in the figure as representative of scenarios of varying political awareness, intensity, and familiarity, which are presented in Figure 8.

When contrasting Figure 8 with Figure 5, we can see that with the exception of low-awareness Remainers, the typology of attitude change most closely resembles Region C (for the pro-Remainers) or Region F (for the centrists or pro-Leavers). The key difference is the low-awareness pro-Remainers, who (per Zaller) should have a probability of attitude change that is equal to (if not greater than) the probability of attitude change for low-awareness centrists or pro-Leavers. This pattern suggests high message intensity and low message
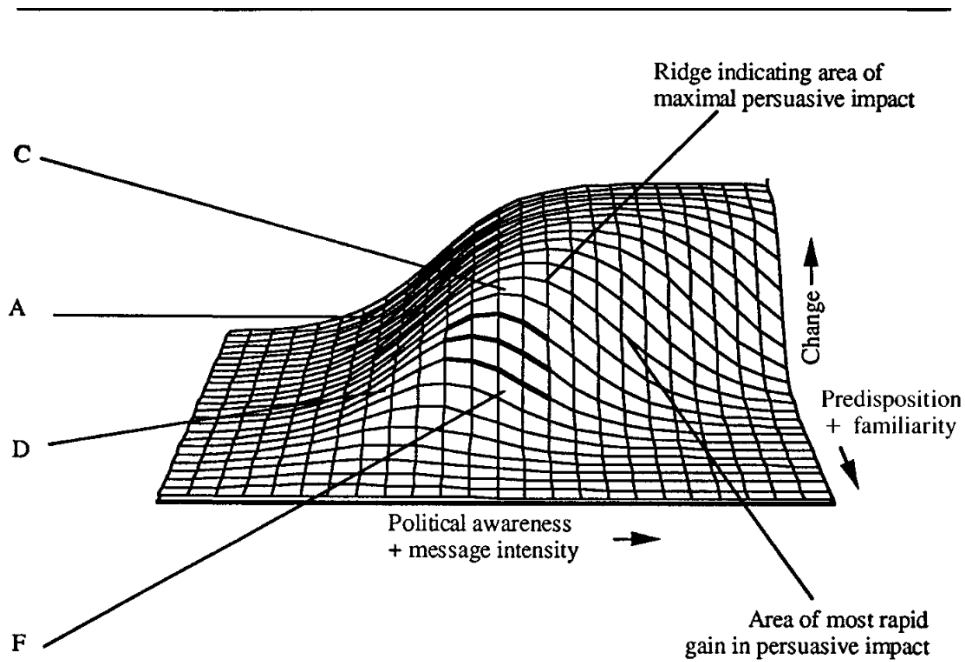
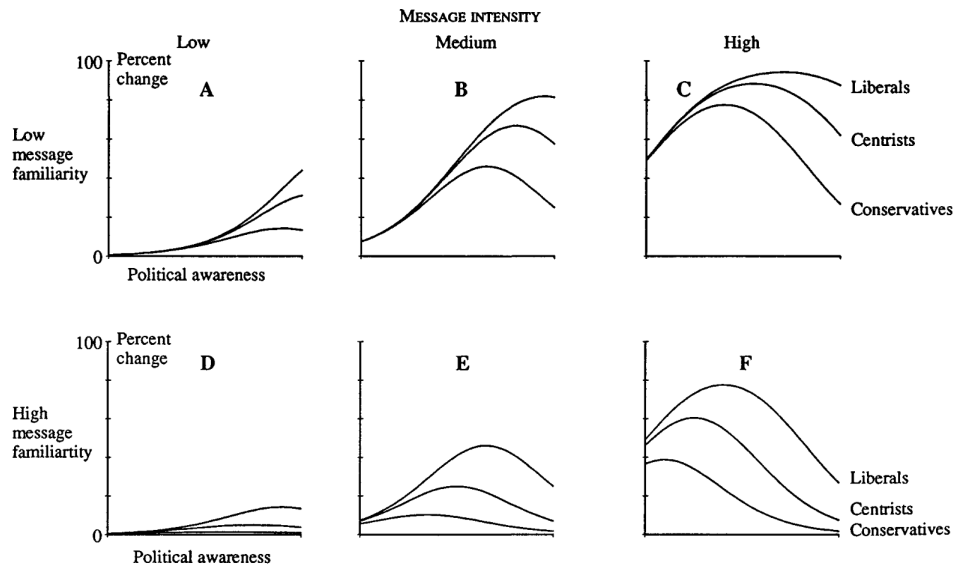Figure 7: Attitude Change as a Function of Intensity and Familiarity (reproduced from Zaller 1992, 157)

Figure 8: Specific Regions in Figure 7 (reproduced from Zaller 1992, 156)

familiarity for pro-Remainers, and high message intensity and high message familiarity for pro-Leavers and

centrists. When considering the media analysis of the Brexit campaign, these observations are somewhat

supported. Clearly, as argued, the campaign was highly intense. Less clear, however, is why pro-Remainers

would be more unfamiliar with the issue than moderates or pro-Leavers. I believe that this finding is largely

a function of the media environment surrounding the referendum. As seen in the media analysis, there was a slight imbalance in terms of sheer message volume in favor of Leave. This could suggest that pro-Remainers are less likely to be familiar with the issue of Brexit simply because there weren't enough pro-Remain messages in the media environment.

Finally, I move next to analyze the arguments of Dobrzynska and Blais (who showed that Zaller's model did not accurately explain attitude change) in light of my results. It may still be the case that those authors' errors were due to problems with the way they operationalized their definitions of reception and acceptance, along with the flaws in their dataset that required them to do this; this is especially so for Smets and Isernia. An analysis of regression coefficients and of the significant values further suggests rejection of the results of Dobrzynska and Blais, but the deeper analysis above shows that we cannot entirely dismiss their work as a singular case. It would be amiss to uncritically reject or accept the RAS model on the basis of these mixed results, especially when I found significant support for its key findings. However, further evaluation in different media environments and in other contexts is crucial. Theories require constant evaluation and updating, and while this thesis may not have found a definite answer one way or the other, perhaps another work may be able to continue this.

On the whole, this thesis has showed several powerful results. First and foremost, this is the first paper in fifteen years that directly analyzes the validity of Zaller's model and I believe provides significant value for that reason alone. Additionally, I have definitively argued from a theoretical perspective and showed from an empirical perspective that Zaller's famous RAS model is both worthy of updating and that my suggestions on how to update it (particularly his selective reception hypothesis and the ways in which individuals receive information) are worthy of investigation and seemed to bear theoretical fruit. Though I may not have found perfect support for the functional forms which I specified as a way to test my model, the basic hypotheses that I have constructed are well-grounded in a wide range of psychological research, analysis of the media, and in the history of political opinion research and combined with the results that I have found suggest that there is at least some validity to my work. Further, the process of constantly iterating to understand the ways in which peoples' political opinions shift has inherent value insofar as it can hopefully inspire others to continue the work that I have conducted here, which will hopefully allow for an expansion of Zaller's

theory and a greater understanding of its consequences. The potential for further work on this subject will be discussed in the following chapter.

6   Conclusion

"Democracy is the worst form of government, except for all the others." — Winston Churchill

With how impactful his work has been to this thesis, I think that it only seems natural that I will ground my conclusion in Zaller's. Reflecting on his own work, Zaller summarizes the crux of his argument as twofold: first, that "individuals do not possess 'true attitudes,' [...] on most political issues, but a series of considerations that are typically rather poorly integrated"; second, that "an interaction between political awareness and political predispositions is fundamental to the process by which citizens use information from the political environment to form opinions" (Zaller 1992, 308). I hope this thesis has made it clear that both of these arguments are incredibly well-supported even today. Zaller's findings on the theories behind measurement and response error have been so incredibly well-accepted by the community that even mainstream news publications agree with them. Further, this thesis has showed that his arguments about the relationship between political awareness and political predispositions are still hugely influential on the ways by which people form opinions. It is clear that Zaller's major takeaways are supported, and that his work is incredibly famous for a reason. The reason for the lack of take-up of his model is therefore likely a combination of the fact that his model still accurately describes political behavior and that it is incredibly difficult to even find a dataset that allows for a useful test of his model.

With the validity of Zaller's work established and reaffirmed, I think it worthwhile to briefly outline the work I have done and to understand how this thesis builds on Zaller and the authors who critique his work. In the introduction, I aimed to reckon with the fact that, in an era where polls are breathlessly reported on in an effort to understand peoples' attitudes, yet have blatantly misrepresented or missed widespread evidence of attitude change, it can seem hopeless to attempt to even analyze opinion data. In the second chapter, I discussed how Zaller's model, which attempted to construct a broad theory about how polling results were generated, was over thirty years old and had not seen significant critique or updating since its publishing. Chapter 2 specifically builds on Zaller by integrating a psychological discussion of the online and memory-based frameworks, along with an analysis of Bayesian reasoning versus motivated reasoning–the second debate in particular is absent from Zaller's work, likely because the terms were not in the academic mainstream at the time. Chapter 3 folded in the work of the critical authors and combined it with a more

rigorous probabilistic embedding of Zaller's theory in order to suggest ways that his work could be re-tested and perhaps even improved upon. In Chapter 4, I took a further dive into *Mass Opinion*, exploring Zaller's deductions and outlining how they could be applied to a contemporary test of the model. Finally, in Chapter 5, I showed that despite the lack of take-up of the model and authors who found otherwise, Zaller's work is still incredibly well-founded and holds value, despite massive shifts in the ways in which people engage with politics; further, I showed that the improvements I suggested in Chapter 3 were meaningful empirically and that there was room to not just evaluate, but to build on his work.

On a normative note, my hope is that this thesis has clearly and distinctly shown that things are not as dire as they may seem. Zaller, Campbell et al., and Lazarsfeld et al. showed that the study of attitude formation through the development of a comprehensive theory can lead to a greater understanding of seemingly incomprehensible results. This thesis has shown that we can extend that to the contemporary era. By analyzing how peoples' minds shift over time and understanding what has precisely caused their minds to change, social scientists can gain greater insights into these complex processes. But, as individuals are bombarded with political messages, it makes sense that peoples' minds change quickly. A single poll– which capture a single draw from a latent opinion distribution–is only a piece of the puzzle. The BES, the CES (utilized by Dobrzynska and Blais), and the 1987 ANES (utilized by Zaller) are all relatively unique datasets because they do not just reduce important topics like an election to a single horserace-style question. They go deeper, and ask about specific considerations that people have in mind (like the ANES) or about the specific messages that people have received (like the BES). What all three have in common, further, is that they re-interview subjects over an extended period of time. All of these factors, while incredibly valuable, are very costly in terms of researchers' time but also in terms of the money needed to create the surveys and help get them to a representative population. This provides yet another reason not to give up on polling, but rather to redouble efforts. By making better polls based on models like Zaller's, and incorporating things like the BES's panel studies, social scientists can continue to get more accurate data that will also hopefully continue to work through other methodological issues of polling, like sample size issues or non-representativeness. Additionally, in terms of specific normative takeaways, this thesis has provided some other interesting results. Firstly, the fact that individuals with more strongly-held predispositions are more

likely to receive cogenial messages may seem to be yet another reminder of the political polarization that has swept America and has been much-bemoaned. However, the results showing that higher political awareness promotes reception of messages that one may not necessarily agree with is a good sign, suggesting that with further education and understanding of politics comes a greater chance of hearing out messages one may not agree with. This serves as encouragement for governments to invest in political awareness as a public good; doing so presents a path towards eliminating such polarization.

I would also be remiss to suggest that the results of this thesis are decidedly conclusive. There are many ways in which this research can continue, both specifically with regard to my work and with regard to political behavior research in general. Firstly, I believe my thesis has shown that theories are always worthy of interrogation and evaluation, and I think it absolutely worthwhile to critically evaluate my RAIS model, just as I did for Zaller's RAS model. In Chapter 3, I suggested one functional form in which message clarity, political predispositions, and political awareness work together to influence attitude change. However, in my analysis, I found that they do work together, but not in the way that I expected. Future studies or analyses of the RAIS model can continue to hone in on a theory of what exactly this functional form looks like and argue for why it should be different. Another important avenue of future work follows from both my work and Strauss's: what, exactly, does one's latent opinion distribution look like? Is it a Beta, as I argued? Is it a Gaussian, like Strauss suggests? As shown in both our works, both have theoretical merit, but neither has been conclusively proven. There are certainly many other avenues in which to evaluate this theory, and I encourage critical engagement with my work as a means to continue to understand the development and expression of political opinion.

The next avenue of future work is with regard to broader applications of Zaller's model, a lofty goal that seems easy but is in fact incredibly difficult. As discussed, what made the BES and the CES so unique as datasets is that they were taken from single-issue elections. When trying to analyze elections based around even two issues, things get much murkier, both from a political perspective and a mathematical perspective. Politically, a voter, when choosing between candidates, in theory has to weigh many issues in their mind at once. If their vote between candidates switches, it is incredibly difficult to say what caused that switch. Without specific data on their awareness and predispositions on many possible issues, discerning on what

issues the reception-acceptance process has changed is incredibly difficult. As above, this only highlights the need for high-quality, comprehensive polling. From a mathematical perspective, things become slightly easier. Through the process of dimensional reduction (otherwise known as principal component analysis), it is possible, through a little linear algebra, to determine how distinct the issues in question are and to utilize a smaller number of issues to represent the full picture. However, any over-simplification in terms of dimension reduction risks losing the full spread of variance in the data (i.e. the full spread of people's opinions across all issues), a tradeoff that requires careful modeling. Future attempts to expand the RAS or RAIS models outside of single-issue elections must keep this in mind when doing so.

Lastly, *The Nature and Origins of Mass Opinion*, as a wide-ranging, dense, theoretical endeavor, invariably (by Zaller's own admittance) overlooks and simplifies. This is an inevitability due to the sheer volume of behavior it purports to explain. By basing my work on Zaller's, the same is necessarily true for this thesis. One might argue that the RAS and RAIS models, in attempting to paint in such broad brushstrokes, over-assume and do not accurately depict the true diversity of peoples' opinion shifts and changes. However, I believe, as Zaller does, that there has never been a better time to attempt to understand the broad. Larry Bartels writes that *Mass Opinion* "provides an admirable model of social-scientific opinion that consistently sheds light on big questions, rather than settling for narrow analyses of less significant political phenomena just because they happen to be easily researched" (Bartels 2012, 2-3). Answering big questions is a difficult endeavor, but by doing so, we can further understand the broader ecosystem of political behavior and understand how seemingly disparate phenomena fit together. Now, more than ever, is the time to understand the broad over the particular, to focus on the forest and not the trees. In today's environment, where polling is declared as having increasingly small predictive power, the results of this thesis show that a deeper theory of the cognitive behavior that undergirds polling can be incredibly useful in understanding the processes by which people change their mind, and thus how they form their opinions. I believe that it is precisely through large-scale theory-building endeavors like Zaller's that we can understand the connections between the varied ways in which political behavior manifests itself and, therefore, to reckon with serious problems.

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8   Appendix: Exploring Bayes' Theorem in the RAIS Model

In this appendix, I will prove the statement that a Beta-Binomial conjugate update does not require assumptions of a Bayesian updating process. This proof requires baseline understanding of Bayes' Theorem, of Bayesian statistics as a whole, and of the definitions of the Beta distribution and Bernoulli and Beta random variables.

Recall from above that Bayes' Theorem, from a Bayesian statistics perspective, is defined as the statement that, for events A and B,

$$\pi(A|B) \; \alpha \; \pi(B|A) \; \pi(A)$$

Let us follow the RAIS model, and define our prior as a Beta distribution; that is, we can write that

$$\pi(A) = \frac{p^{\alpha-1}(1-p)^{\beta-1}}{\beta(\alpha,\beta)}$$

Let us then consider a set of N data points, say $X_1, X_2, \ldots, X_N$. In our case, we consider these to be a set of considerations that one has accepted, where each $X_i \in (0,1)$. As defined above, we know that our data is derived from a two-step independent Bernoulli process; that is, we can write that $X_1, X_2, \ldots, X_N \overset{iid}{\sim}$ $Bernoulli(p)$ for some p.

The likelihood of this dataset occurring is thus:

$$p^k \cdot (1-p)^{N-k}$$

where we have k observations of side 1 and thus $N-k$ observations of side 0. We can then understand this as our *likelihood*; that is, this is the probability of the data arising under the conditions of the prior, which is $\pi(B|A)$. The conditions of a likelihood require that p must be drawn in some way from our prior. But, note that the process laid out in the RAIS model is necessarily prior-dependent, as ones' predisposition (i.e. their prior) controls the probability of receiving and accepting a given consideration. Thus, the Bernoulli process above controls the generation of each X_i, and hence we know that our data is not independent of

the prior, as desired. Further, since we chose to utilize the Beta distribution, we can thus write that

$$\pi(A|B) = \frac{p^{\alpha-1}(1-p)^{\beta-1}p^k \cdot (1-p)^{N-k}}{\beta(\alpha,\beta)} = \frac{p^{\alpha+k-1}(1-p)^{\beta+N-k-1}}{\beta(\alpha,\beta)}$$

By definition, this is a Beta distribution, with $\alpha = \alpha + k, \beta = \beta + N - k$. Since the posterior distribution, $\pi(A|B)$, is the same type of distribution as our prior, we call this a *conjugate pair* of distributions. Crucially, note that in our understanding of the data, *we made no assumptions about the process in which it was generated*. All that is necessary is that our data is in some way conditional upon our prior–which is clearly true by the RAIS model, as one's predisposition definitionally influences the messages one accepts. Clearly, we do not have to accept a Bayesian paradigm of information processing in order to make use of Bayes' Theorem to incorporate new data into our prior distribution.