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Election, Cognitive Dissonance and Political Polarisation:
Evidence from Laboratory, Economic Experiment

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Abstract

One significant social phenomenon that happen in many democratic countries are political polarisation, where voters exhibit a polarised belief upon an identical piece of information about a candidate or political party after an election. Various researches have cited Festinger's (1962) theory of cognitive dissonance as the major psychological explanation over the emergence of this phenomena, in their attempt on trying to establish a causal claim between the mere act of voting and political polarisation. This study aims to test a more evident causality of this notion via laboratory experiment involving a homogeneous group of university students, where confounding and unobservable variables that plague empirical studies are isolated. This economic experiment simulates bipartite presidential voting with two hypothetical candidates while controlling subjects' preferences via induced value and without involving any real-life socio-political cues. The study divided subjects into two treatment conditions, one of those who can vote and another who cannot. Our hypothesis predicts that, for all subjects in treatment group, voting will amplify the cognitive dissonance, resulting in a more polarised belief which is measured from subjective probability statement. The data provide partial support for this hypothesis, where voting affects polarisation only on subjects whose supported candidate has lost the election.

Keyword(s): Belief polarisation, cognitive dissonance, election, laboratory experiment

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I. Introduction

Belief polarisation is generally defined as a phenomenon where two agents are updating their beliefs in an opposite direction after being exposed to similar evidence (Kelly, 2008). It has previously been widely regarded as one of irrational human behaviour that brought on several adverse effects on socio-political life, such as hampering cooperation between people with different political views, rising economic inequality and creating difficulties in democratic processes to reach a policy consensus.[3] The negative consequences of polarisation on democratic societies are amongst the reasons why studying such a topic is essential, as well as scientific motives for knowing further how such condition emerges. Interestingly, empirical studies detect that the effect polarisation is amplified by the act of voting (Mullainathan and Washington, 2009; Bølstad et al., 2013; McGregor, 2013), which is the main feature of modern democracy itself. Based on secondary survey data, these studies found that those who cast a vote in an election tend to exhibit a higher degree of political polarisation than those who do not. This phenomenon has been related to a human psychological feature called cognitive dissonance (Festinger, 1962).

However, the nature of these studies does not allow the researcher to establish a causal link between voting, cognitive dissonance, and political polarisation. Various unobserved factors persist in elections, such as selection effect due to voter turnout bias (Dinas, 2012), alternative explanations such as self-perception (Bem, 1967), candidate gender bias (McDermott, 1997), tactical voting (Bølstad et al., 2013) and ideology bias.[4] These various uncontrollable factors become main limitations on drawing the exact effect of election and belief polarisation, as well as replicability issue of the study designs. These issues open up an opportunity to exploit an alternative method for testing the role of cognitive dissonance on belief polarisation, one of the possible ways is via an experimental approach.

The research question of this paper aims to test the causal link between the mere act of voting and political polarisation via cognitive dissonance. Section II provides the construction of our hypothesis by combining three theoretical frameworks, which represents each element of the research question. This study explores the spatial theory of voting to explain the dissonance reducing behaviour of voters, dissonance condition to explain how dissonance arises and borrows the Bayes network approach to measure belief polarisation. The central thesis of this

[3] https://www.the-american-interest.com/2015/12/22/why-polarization-matters/
[4] In his writing, James Dennison mentions how personality traits, such as conscientiousness, are also related to party choice. See more: http://blogs.lse.ac.uk/politicsandpolicy/populist-personalities-the-big-five-personality-traits-and-party-choice-in-the-2015-uk-general-election/#1

unified theoretical framework suggests that after controlling candidate preferences, voting generates a greater need of consonance, which in turn also triggers a more substantial cognitive dissonance if exposed to an exogenous dissonant condition. Thus, the act of voting itself can increase cognitive dissonance and thus lead to political polarisation. Section III provides a more detailed explanation of the experimental design of this study. Section IV explains the experimental result and formal hypothesis testing. Section V provides a discussion and the potential area of further research.

II. Theory

II.A. Literatures on Cognitive Dissonance and Political Polarisation

The term cognitive dissonance has been firstly coined by Festinger (1962), in which defined as a state of mental discomfort due to a conflicting relationship between personal cognitions—the attitude, a subjective knowledge in forms of belief or values—against his own real-world actions or behaviour. An example of this cognitive dissonance can be seen as follows: a person believes that using plastic bags are harmful to the environment and he cares about the environment, but in daily life, he still uses a plastic bag. In this example, the person experiences cognitive dissonance since his attitude and behaviour are contradicting each other. Festinger argues that human beings seek for consistency between his attitude and his behaviour. Related with the previous example, two ways to reduce cognitive dissonance is by either changing one's behaviour (in this case by stop using plastic bags) or changing the attitude (in this case by weakening the belief that plastic bags harm the environment). However, given that past actions are unchangeable, the only feasible way to reduce cognitive dissonance is thus via a change in attitude. This notion presents a new perspective in seeing the relationship between attitude and behaviour, where previously the consensus lies on a one-way relationship, that attitude changes behaviour (Eagly and Chaiken, 1993). Cognitive dissonance theory implies that it is possible to have some reverse causality between these concepts so that behaviour changes attitude. In other words, prior actions profoundly influence human attitude. As a ground-breaking theory in the field of cognitive psychology, cognitive dissonance often serves as an explanation over various societal phenomena, ranging from consumer behaviour (Gbadamosi, 2009), social behaviour (Stone et al., 1994; Fried and Aronson, 1995), and the focus topic of this paper, belief polarisation in the context of politics (Beasley and Joslyn, 2001; Mullainathan and Washington, 2009; Bølstad et al, 2013; McGregor, 2013).

Various studies have yielded different explanations from different context and research settings, but the main finding can be generalised as follows: voting generates greater cognitive dissonance compared to not voting, which in turn amplifies belief polarisation (Bølstad et al., 2013). When voters vote, they signal their preference toward a candidate or party. Over the course of time, political parties and candidates may experience shocks (for example, involvement in public scandals or unfavourable opinions), which generates dissonance between action and reality within a voter. Since past votes were unchangeable, the only mechanism left for voters to reduce this dissonance is to cast a favourable opinion toward their selected party and thrown negative opinion against their opposing party on a political spectrum. Given the broad array of existing empirical evidence, it appears natural to conclude that voting has created belief polarisation.

However, there are significant limitations that refrain us to naively draw a causal relationship between voting and belief polarisation via sole reliance on empirical evidence. Given that some studies do not include unobserved factors, —such as turnout bias (Dinas, 2012), gender bias (McDermott, 1997; Koch, 1999), party identification (Garcia et al., 2012) and racism issues (Sigelman et al., 1995)—the established causal inferences may be dubious. When such problem presents, an experimental method would be a natural alternative to investigate the exact effect of how an election can lead to a polarised opinion among the society members. The experimental study is not new to the political science in the context of voting (some examples: Forsythe et al., 1993; Towner and Dulio, 2011; Niven, 2006). Despite field experiments allow the researcher to observe the natural response of subjects, they also have limitations such as limited control over unobservable variables, lack of replicability, noncompliance and attrition. These limitations would not be present in a laboratory setting, which is used in this study.

The quest of unravelling causal links between voting and belief polarisation has led us to the following research question: Does voting induce belief polarisation via cognitive dissonance reduction mechanism? By taking into account the limitations of previous studies, we present an experimental study to provide a methodological contribution to the existing literature.

II.B. Modelling Cognitive Dissonance in Election Context

The first step in designing experiments on the political decision is to construct a model that translates political preferences, without using any socio-psychological cues that plague empirical studies. We aim to develop an experimental design that follows the original structure of Festinger and Carlsmith (1959). Festinger and Carlsmith's experiment structure resembles a mental

process on how cognitive dissonance arises. Various researchers have adopted such experimental structure (for example, Dickerson et al., 1992; Staw, 1976; Anduiza et al., 2013).

This structure consists of three distinct part. The first part is the task performance or belief formulation procedure, where subjects are performing a specific task to formulate their prior belief. The second component relates to the external pressure or source of dissonance, in which subject faces tension to conduct something that is against thei belief that has been formed or elicited in the previous task. Thirdly, it is the part of the measurement where subjects' posterior belief is being measured after doing the task. In this experiment, I will elaborate one theory for each of the three-part structure. Firstly, I use the theory of spatial voting to generate a method of belief formulation. On the second part, I refer to the classical cognitive dissonance. The third component, belief polarisation, will be measured based on Bayesian updating approach.

We begin to formulate a framework on how to incorporate the three-part structure in this experiment. First, we start with the belief formulation part. This experiment aims to remove confounding factors such as socio-political cues of candidates in the elections, but the removal of these cues also poses a risk of hypothetical bias (Murphy et al., 2005) as there are no utilities derived from the voting process. To resolve this issue, we opt to use an induced value approach (Smith, 1976), where a part or all agents' latent preferences are internalised into one single dimension. This induced value can be reframed in the context of the spatial voting theory (Enelow and Hinich, 1984). Spatial theory of voting is a useful framework for us to internalise all the socio-psychological motives of voting into a single latent dimension that induces agents' utility while still maintaining experimenter's control over subjects' preferences. Proposed by Black (1948), the most basic form of the spatial theory of voting relies on two central assumptions: 1) the single-peaked, quasi-concave preferences of voters and 2) the unidimensional policy space. Single-peaked preference in this context means that a person's most desired political stance can be represented only by a single point within the spectrum. Any point beyond this single point would yield less utility compared to the peak. Think of left and right-wing politics, or conservative versus liberalism as examples of a unidimensional spectrum. Any position within this latent dimension can represent any political values, parties or their representations. A person that has a single-peaked preference

In this study, we use the notation of A and B to represent two arbitrary points that designate candidates. Given that there are two candidates k (A and B), voters' single-peaked preferences can be described in a utility model as follows, adapted from Enelow and Hinich (1984):

$$\pi_j^k(x_k) = C - \left(\theta_j - x_k\right)^2 \qquad Eq.1$$

Where j represents voter, x_k represents candidate k point in the latent dimension, C represents a constant and θ_j translates to the most preferred value by voter j, where the assumption of single-peaked preferences lies. The quadratic loss term allows this utility function to have a quasi-concave property; the further the value of a candidate compared to individual peak preference, the disutility increases progressively.[5] Thus, the basic rule of voting would be as following:

$$A \succcurlyeq B \equiv \pi_j^A(x_A) \geq \pi_j^B(x_B) \qquad Eq.2$$

$$A \succcurlyeq B \equiv C - \left(\theta_j - x_A\right)^2 \geq C - \left(\theta_j - x_B\right)^2 \qquad Eq.3$$

So that:

$$A \succcurlyeq B \equiv \left(\theta_j - x_A\right)^2 \leq \left(\theta_j - x_B\right)^2 \qquad Eq.4$$

Candidate A is preferred over candidate B if the absolute distance of candidate A's position in the latent dimension to *j*'s ideal point is lower than the absolute distance of candidate B's to *j*'s ideal point. Thus, a rational agent who obtains more utility when candidate A wins would be a supporter of candidate A. Assuming non-satiation condition holds, one could merely induce this preferences into an experimental design by assigning a higher payoff for A to B if we want a particular subject to support A, vice versa. This concept will then be elaborated further as *utility from election outcome*.

For now, we already have a *utility from election outcome* as a function of citizen's ideal point and winning candidate. However, this utility function does not yet explain any story regarding with utility for those who can vote, against those who are not able to vote. Moreover, what does it have to do with cognitive dissonance? If we analyse voting from the viewpoint of contribution theory (Hinich and Pollard, 1981), voting can be seen as a rational act to increase own utility. If reducing dissonance (or improving consonance) between the state of the world and belief or preferences

[5] The quadratic loss function discussed here is one of several ways to formalise single-peaked preferences, since it has the property that global and local minima are identical. This approach is commonly used in the existing literature to model spatial preferences on the political topic. Several examples of the election models that incorporate this quadratic loss can be traced to Davis et al. (1970), Frey and Schneider (1978) and Enelow and Hinich (1984). Other alternative such as linear loss (Enelow and Hinich, 1984) is also an option to reflect a single-peaked preference, but this function by nature does not fulfil continuity axiom of preferences.

is the objective of an individual, then we can say that individuals maximise utility by choosing courses of action that reduces dissonance. In this sense, the utility can be considered parallel to cognitive consonance. The question now is how a voter would react within a choice problem to maximise his or her utility?

An economist would say that agents would choose courses of action that maximise their expected utility (von Neumann and Morgenstern, 2007). In our context, it means maximising the probability of having a consonance condition. Our framework borrows the model from Ferejohn and Fiorina (1974) that explains the derivation of *expected utility from voting.* Suppose that there is a bipartite election with candidate A and B. Suppose that v_j^A is the vote of citizen j to candidate A, which equals 1 if he chooses A, 0 when he does not vote and -1 if he chooses B. Let N_A indicate total vote for candidate A *without* citizen j's vote, whereas N_B indicate total vote for candidate B without citizen j's vote. Notation p_l represents a subjective probability of condition l to occur, where $p_1 + p_2 + \cdots + p_5 = 1$. Below is the table of comparison of utility from voting compared to not voting.

Table 1. Utility from Election Outcome

Conditions/ Voting Behaviour	Condition 1 (p_1) $N_A > N_B + 1$	Condition 2 (p_2) $N_A = N_B + 1$	Condition 3 (p_3) $N_A = N_B$	Condition 4 (p_4) $N_A = N_B - 1$	Condition 5 (p_5) $N_A < N_B - 1$
Vote for the supported candidate: $v_j^A = 1 \mid v_{ij}^B = -1$	Candidate A win $C - (\theta_j^A - x_A)^2$	Candidate A win $C - (\theta_j^A - x_A)^2$	Candidate A win $C - (\theta_j^A - x_A)^2$	Tie	Candidate B win $C - (\theta_j^A - x_B)^2$
No voting: $v_j^A = v_{ij}^B = 0$	Candidate A win $C - (\theta_j^A - x_A)^2$	Candidate A win $C - (\theta_j^A - x_A)^2$	Tie	Candidate B win $C - (\theta_j^A - x_B)^2$	Candidate B win $C - (\theta_j^A - x_B)^2$
Vote against the supported candidate: $v_j^B = 1 \mid v_{ij}^A = -1$	Candidate A win $C - (\theta_j^A - x_A)^2$	Tie	Candidate B win $C - (\theta_j^A - x_B)^2$	Candidate B win $C - (\theta_j^A - x_B)^2$	Candidate B win $C - (\theta_j^A - x_B)^2$

Source: Modification of Ferejohn and Fiorina (1974)

Before jumping to the interpretation of this table, it is worth noting that this theory has several assumptions. First, the framework here is based on decision theory instead of game theory, which implies that no strategic interaction influences a voter decision and voters do not anticipate any of the upcoming tasks. If voters know beforehand that they are expecting shock conditions, experimental evidence shows that voters tend to behave strategically over cost and benefit of voting (Blais and Young, 1999). Second, voters do not know the exact distribution of population

preference over candidates, so this process of belief formation relies on subjective probability.[6] Intuitively, this table explains what kind of outcome would emerge as the response of the citizen j, given all vote distribution without excluding his vote. For example, if $N_A = N_b$, then a single vote from citizen j on candidate A will make $N_A + v_j^A > N_b$, thus rendering A as the winner. Thus, we can find the *expected utility from voting* for a person who supports A ($\pi_{ij,j\to A}$) as follows:

For a supporter of A, the expected utility from voting A is:

$$E\left[\pi_{j,j\to A}^{VOTEA}\right] = (p_1 + p_2 + p_3 + 0.5p_4)\left\{C - \left(\theta_j^A - x_A\right)^2\right\} + (0.5p_4 + p_5)\left\{C - \left(\theta_j^A - x_B\right)^2\right\} \quad Eq.5$$

For a supporter of A, the expected utility from *not* voting is:

$$E\left[\pi_{i,j\to A}^{NOVOTE}\right] = (p_1 + p_2 + 0.5p_3)\left\{C - \left(\theta_j^A - x_A\right)^2\right\} + (0.5p_3 + p_4 + p_5)\left\{C - \left(\theta_j^A - x_B\right)^2\right\} \quad Eq.6$$

For a supporter of A, the expected utility from voting B is:

$$E\left[\pi_{j,j\to A}^{VOTEB}\right] = (p_1 + 0.5p_2)\left\{C - \left(\theta_j^A - x_A\right)^2\right\} + (0.5p_2 + p_3 + p_4 + p_5)\left\{C - \left(\theta_j^A - x_B\right)^2\right\} \quad Eq.7$$

The necessary condition for supporter A who can vote to have more expected utility than those who are unable is $p_3 > 0,\ p_4 > 0$, and $\left(\theta_j - x_A\right)^2 < \left(\theta_j - x_B\right)^2$.[7] Since probability by nature is always greater than zero and utility from election outcome is always higher when supported candidate wins, for all supporters we can apply such proposition: those who can vote will have higher expected utility (has a higher probability of having consonance) than those who cannot vote.

The second step of designing this experiment would aim to provide a shock condition for the subjects and his response. The main objective of this shock function is to expose the agent into a dissonance condition. Festinger (1962) claims that the magnitude of dissonance increases as the importance of cognition also arise. One can interpret this theory as when people have higher stakes to maintain consonance; they will have a higher reaction for dissonance. Here, the model incorporates this concept via the shock function δ_{ij}^k as in the following:

[6] Initially, Kahneman and Tversky (1972) try to explore the concept of representativeness heuristics. They found that subjective probability judgement is highly determined by the most noticeable feature characteristics of a sample data, in accordance to population or natural process that give rise to such distribution. For example, under our context of a bipartite election, if subject perceives that population are equally distributed concerning political support toward two candidates, the subjective probability for either candidate winning would be approximately close to this equal distribution of support. Under this view, the subjective probability distribution function (pdf) would follow the normal distribution, resulting in $p_3 > p_2 \approx p_4 > p_5 \approx p_1$, where the equal probability p_3 is the most likely one that came up in subject's belief.

[7] See Appendix 1 for proof.

$$\delta_j^k = -\omega\left((e - \left(\theta_j - x^k\right)^2)E[\pi_j]\right) + \omega^2 \qquad Eq.8$$

Here, $e - \left(\theta_j - x^k\right)^2$ represents the *utility from the election outcome*, and $E[\pi_{ij}]$ represents the *expected utility from voting, e* is a positive constant that takes a value between $\left(\theta_j - x^A\right)^2$ and $\left(\theta_j - x^B\right)^2$ and $-\omega$ is a shock parameter. The multiplication between *utility from the election outcome* and *expected utility from voting* explains the degree of consonance between election outcome (state of the world) and individual action (voting). We refer to this concept as *cognition effect*. A positive consonance is obtained whenever the outcome is aligned with individual action. When the election outcome is negative, a subject is then experiencing dissonance since his expectation does not align with the result. Thus, whether a person experiences consonance or dissonance depends on the outcome of the election, and the degree of this consonance or dissonance depends on the expected utility from voting.

Now, we introduce a cognitive dissonance to the subject via shock parameter ω. Since this parameter has a negative value for all agents, any effect of cognition will be reversed. For example, voters who experience positive cognition due to the victory of their supported candidate will interpret the shock condition as cognitive dissonance. Meanwhile, voters whose candidate lost would instead interpret the shock as a cognitive consonance.

In the context of politics and voting, one conventional method for generating dissonant condition on voters in the context of election is by introducing dissonant information (Sears and Freedman, 1967; Sweeney and Gruber, 1984; Rijkhoff, 2016). One of the most common types of dissonant information that is being evaluated in various studies is negative news associated with winning party or elected candidate. The aforementioned cognitive framework predicts that this identical piece of information $-\omega$ will be interpreted differently, according to the direction of the cognition effect. For a person whose supported candidate won (positive $\left(e - \left(\theta_j - x^k\right)^2 E[\pi_j]\right)$), shock function is interpreted as cognitive dissonance, where for those whose supported candidate lost (negative $\left(e - \left(\theta_j - x^k\right)^2 E[\pi_j]\right)$), the shock function serves as a cognitive consonance.

We further add ω^2, which captures the cost of shock reduction measure. This component of cost is introduced by the argument that reducing cognitive dissonance requires some level of self-deception and imposes some degree of mental cost when people do so (Konow, 2000). Since the shock function behaves differently according to the *election outcome utility* of each voter, different voter experiences a different optimisation process.

To understand how this optimisation process differs among voters, recall our utility function on the first stage. Let us add the shock condition to this equation. Now, we have $\pi_j + (-\omega(e - \left(\theta_j - x^k\right)^2 E[\pi_j]) + \omega^2)$ as voters' expected utility. Thus, concerning ω, we derive the optimisation condition as follows:

$$\frac{\partial U_j}{\partial \omega}\left[\pi_j + (-\omega(e - \left(\theta_j - x^k\right)^2 E[\pi_{ij}]) + \omega^2)\right] = -(e - \left(\theta_j - x^k\right)^2 E[\pi_j]) + 2\omega = 0$$
$$\omega = \frac{1}{2}(e - \left(\theta_j - x^k\right)^2 E[\pi_j]) \qquad Eq.9$$

From the optimisation condition, we conclude as follows:

a) For those who are having a cognitive dissonance (supported candidate won, positive $e - \left(\theta_j - x^k\right)^2$), then ω would be positive and lead to dissonance reduction process.
b) For those who are having a cognitive consonance (supported candidate lost, negative $e - \left(\theta_j - x^k\right)^2$), then ω would be negative and lead to consonance maximisation process.
c) Given identical $e - \left(\theta_j - x^k\right)^2$, the absolute magnitude of optimum ω is higher for those who have higher expected utility from voting, i.e. those who can vote, compared to those who cannot ($E[\pi_{j,j\to k}^{VOTEk}] > E[\pi_{j,j\to k}^{NOVOTE}]$).
d) On point c), voting will amplify the dissonance minimisation and or consonance maximisation process, thus leading to a more polarised reaction compared to non-voting.

But, how does this model translate into the real-world implication? Recent empirical evidence (Taber and Lodge, 2006; Anspach, 2017; Taber, Cann and Kucsova, 2008; Anduiza et al., 2013) have shown that it is possible for a same piece of information can be interpreted contrarily if there is a different prior belief that affects how subject digest information. This phenomenon is also known as disconfirmation bias[8], in which prior belief contributes to how subjects evaluate information (Edwards and Smith, 1996). According to our model, this prior belief is generated through the *expected utility from voting*.

II.C. Measuring Belief Polarisation and Hypothesis

Now that we have seen how differences in the ability of voting would lead to polarisation of reaction, the remaining challenge that persists now is on measurement issue. One common

[8] Disconfirmation bias: People counter-argue arguments that contradict their belief and accept supporting arguments without further scrutiny (Lord, Ross and Lepper, 1979).

framework to measure belief polarisation is via Bayesian reasoning, which even acts as a starting argument that shows why belief polarisation is irrational (Klaczynski, 2000).

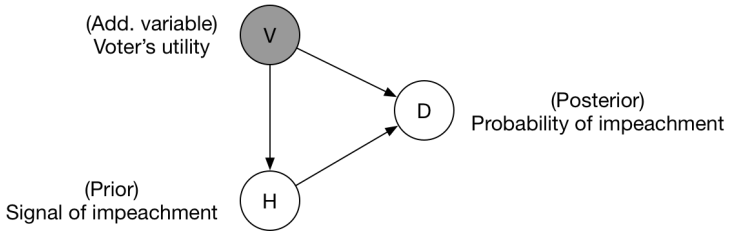
We start by recalling Bayes theorem formula:

$$P(H|D) = \frac{P(D|H)P(H)}{P(D|H)P(H)+P(D|!H)(1-P(H))} \qquad Eq.10$$

Where D resembles data and H means hypothesis. Suppose that there are two agents, A and B, and that H_A and H_B are the prior beliefs of respective agents. Under standard Bayesian updating, a person with different prior belief $H_A \neq H_B$ will update their belief in a similar direction, given they are exposed to identical evidence $P(D|H)$. This process will result in $H_A < H'_A$ and $H_B < H'_B$, which is also referred to as 'parallel updating' (McClelland, 2013).

Belief polarisation, in the Bayesian term, is then said to occur when divergence updating emerges. Parallel updating has been long considered as the normative approach of naïve Bayesian updating by the scientific community (Jern et al., 2009), despite evidence that subjects are often biased from perfect naïve Bayesian learning process (Hill, 2017). Using Bayesian network approach, Jern et al. (2014) explain that it is possible for a divergent updating to occur rationally when there is an additional latent variable 'V' that influence subject's judgement over a piece of information. This approach of measuring latent variable has been proven capable of explaining the process of divergent updating (Cook and Lewandowsky, 2016). In their paper, Cook and Lewandowsky (2016) controlled political views as an additional variable and observed how the difference in political views among participants influences their interpretation of information—climate change news in this context. They found the evidence of belief polarisation as some people with a certain ideological view (i.e. leftists) believes more in scientists, while others on the opposing side (right-wing) of the spectrum believe less.

Graph 1. Polarising Bayes Net Illustration



Since an ideal model of belief polarisation measurement would involve elicitation of prior belief and posterior belief, this imposes a methodological challenge when the preferences that

formulate prior belief are induced. Alternatively, under the context of the research question of this paper, we are interested in observing divergent updating in relative terms. This research relies on the assumption that both voters and non-voters have an identical distribution of prior belief due to randomisation and similar information exposed to the samples. In this way, belief polarisation is measured as a relative term of comparison between the posterior belief of the two groups. Also, since the payoff is symmetrical between candidate A and candidate B supporter and also between control and treatment group, and they are also exposed to identical dissonant information, it is safe to assume that both sides of supporters have identical latent prior. Thus, the only information that needs to be elicited from the subjects would be their estimated posterior probability. Any variation in stated posterior probability would indicate the presence of this latent additional variable V due to a difference in ability to vote. About equation 9 of the spatial model in the previous section, we can refer the latent variable V as the expected utility from voting ($E[\pi_{ij}]$) and the H prior as the election outcome ($e - \left(\theta_j - x_i^k\right)^2$). The combination of latent variable V and H prior would then dictate the posterior belief D or the individual response of dissonance reduction or consonance improvement. Since we are comparing polarisation as the degree of dissonance reduction between agents, our proxy of belief polarisation is then derived from the difference posterior belief.

If posterior beliefs are the measurement of belief polarisation, how does then we measure it? The previous study such as Anduiza et al. (2013) proposes a vignette method that can be used to elicit electorates' belief. In their case, subjective belief is defined as the subjective probability stated by an individual that a given hypothetical vignette is true. For example, how much a person belief in a news article which claims that his supported party has been involved in corruption. Taking this approach as inspiration, we modify this approach that fits with our hypothetical voting situation.

Here, we illustrate and present several hypothetical numbers for individuals. Suppose that the elected candidate has been suspected to be involved in a corruption scandal. The probability that he is guilty is 0.5. If he is guilty, there is a 0.7 conditional probability that he is going to be impeached. Then, there would be a signal H from a news outlet to all subject which shows a potential impeachment of the winning candidate. However, there is also a probability that this signal is inaccurate, in which only 70 per cent of the signal is correct. Under this scenario, we can analytically derive the objective posterior probability. Naturally, we would ask the subject of how likely he thinks that the candidate would be impeached, given the news is true. The objective answer to this question then would be 0.84. This would be a response from a person that is not influenced by latent V variable, i.e. a person who has not been biased by a need for consonance improvement or dissonance reduction.

On the other hand, a person that is biased by the need for consonance improvement or dissonance reduction would express a different response compared to the aforementioned objective answer. If a subject state a subjective probability above this number, it would mean that he overestimates the validity of the news, thus indicating the positive influence of V. On the other way around, if a subject state his probability below the objective threshold, he would underestimate the validity of the news, meaning that V influences prior and posterior judgement in an opposite way (Sanbonmatsu et al., 1997). To sum up, subjective belief would influence probability underestimation and overestimation. However, since our research is focused on polarisation in a relative term, it is not necessary to compare elicited subjective probability against objective probability. Instead, it is possible to do a simpler approach by comparing the subjective probability between subjects in different treatment groups, as long as all subjects are exposed to an identical prior belief formulation process.

This model is supported by results from empirical research (Taber and Lodge, 2006; Morris, 2007; Prior, 2013). By combining this perspective with our formalised model of cognitive dissonance, it is expected that political supporters that can vote would exhibit larger variation in their subjective probability estimation. More formally, the derived hypothesis is as follows:

HA: Subjects who can vote will exhibit a larger degree of political polarisation than those who cannot.

This central hypothesis is then broken down into two sub-hypotheses:

HA1: Voters in treatment group whose candidate were elected would have a *lower* stated posterior probability of elected president impeachment than voters in control group whose candidate was elected, or $P_{vote}^{win}(H|D) < P_{novote}^{win}(H|D)$.

HA2: Voters in treatment group whose candidate were *not* elected would have a *higher* stated posterior probability of elected president impeachment than voters in control group whose candidate was *not* elected, or $P_{vote}^{nowin}(H|D) > P_{novote}^{nowin}(H|D)$.

III. Experimental Design

This research design is formulated in a way it simulates a one-shot bipartite presidential election, where the design incorporates shocks in the form of hypothetical vignette experiment, as used by Anduiza et al. (2013). It is a 2x1, between-sample design. The design consists of two main parts: the first part is the election, and the second part would expose the shock condition. There were

two treatment conditions: no-vote (control) group and voting (treatment) group, in which subjects were allocated randomly from the subject pool. The experiment would take place in Indonesia for budgetary and technical reasons.

We begin with the first stage. At the beginning of this stage, samples in both no-vote and voting group were being explained that they would participate in a simulation of the presidential election. Each participant was randomly assigned to be a supporter of either candidate A or B with equal chances. A pseudo-random algorithm was incorporated in our instrument to make sure that proportion of candidate A and B supporter is identical or close to equal (the difference between the number of supporters cannot be larger than 1). We provided all subjects in both treatment condition with information that supporters for either candidate were close to equal, but the exact proportion was not given. The computer terminal shows all of the instructions, and subjects were asked to read each instruction carefully. Election outcome determines the payoff for this stage. All subjects were informed with this payoff scheme before any voting: if the winning candidate were similar to subject's assigned preference, (s)he would obtain 40 points. If the supported candidate as lost, (s)he would not receive any points.

The only difference between no-vote and voting group lies in their ability to vote. In the control condition, all subjects within a session were unable to vote, regardless of their candidate preference. In this case, the election winner was randomly selected with an equal probability of 0.5 for each candidate. For those in the treatment condition, subjects were allowed to vote for either candidate. Free election means that it was also possible for a subject to vote for a candidate that is against his/her assigned preference, although an abstain position is impossible. The voting simulation follows the typical 50%+1 majority rule, in which candidate with most voters would be selected as a winner. After all subjects vote or progress to the next pages, the election result was revealed to all subjects, as well as how much points that they had gained. Despite playing a typical election scenario, subjects in treatment condition were not informed on the exact voting result, i.e. the number of voters who voted for either candidate. This condition also applies in the control group. The only available information for all subjects was which candidate had won the election. When all subjects had been informed on their payoff from the election, the game proceeds into the second stage.

In the second stage, all subjects for both treatment groups follow an identical process. They were exposed to an identical vignette resembling a piece of a news article. This article made a claim that the recently elected president, either A or B depending on the election outcome, has been involved in a corruption scandal. Anduiza et al. (2013) found that a corruption case done by

political figures act as a potent source of dissonance. Since changing political orientation is more difficult than changing attitude, people will tend to adjust belief and be more tolerant to corruption cases which were done by figures from their respective parties. The opposite holds true; people tend to provide a more severe judgement whenever this candidate comes from a political opponent. Another potential dissonant news that could be used is campaign fraud (Dominguez and McCan, 1998), but in this study, we opted for public sector corruption as it has been one of the most dominant topics of fraudulent behaviour and attracts Indonesian public attention widely (Olken, 2007).

Along with this vignette, we also provided some explanations that there was an exogenous probability for the impeachment of the elected president. At the end of the game, the computer would materialise this risk of impeachment which affected the payoff of all players. Should the impeachment take place, 30 points were deducted from each subject that *support* (not necessarily vote for) the winning candidate in that session, while each subject that *does not support* the winning candidate would gain 10 points. If this condition materialises, it would, in turn, equalise all payoff from the election for all subjects. On the other hand, if the impeachment did not take place, there would be no change in points.

The primary objective of the second stage is to elicit belief from subjects regarding their attitude toward each candidate, *after* observing the dissonant information. In other words, the posterior belief of each subject was extracted. However, extra caution should be taken when using a news-like vignette as dissonant information. Any individual response that arises after observing information is formed via two effects: affective and cognitive channel (Price et al., 1997; Gross, 2008). In other words, in addition to an individual's cognitive evaluation, texts with political contents could also trigger an emotional response that simultaneously affects the opinion of a subject. This emotional response is not a variable of interest in this study. However, its presence may generate a noisier response that has an adverse potential for our analysis.

To elicit a belief while controlling for this emotional response, we opt for the following method. There were two questions asked of all subjects. The first question was a non-incentivised belief elicitation, where subjects were being asked to state a probability on how likely they would think that the candidate was guilty. We also put some emphasis that any answers provided for this particular question would not affect their payoff in any way. More specifically, the question asked was as follows:

Q1: *Given the information above, how likely do you think the president is guilty?*

The instructions emphasised that the stated belief would not have any effect on the impeachment probability, thus preventing subjects to behave strategically. Since there is no objective truth in this question and no implication toward payoff whatsoever, we can safely assume that the response to this question would merely contain affective reaction of an individual. Later, we can use this response as a control variable in our analysis. From this point onward, we refer to this question as Q1.

The second question was an incentivised belief elicitation. Despite the potential to capture both affective and cognitive reaction, the main advantage of using incentivised belief elicitation is allowing the researcher to provide a more comparable belief measurement since answers are compared to an objective truth, which is an objective probability. Incentivised belief elicitation has been found to improve the accuracy of provided answers, compared to a non-incentivised method (Offerman et al., 2009; Gatcher and Renner, 2010; Wang, 2011). Similarly, any answer given by the subject would not change the impeachment probability as in the first question. However, this time the belief elicitation was incentivised as a function of the prediction accuracy. As in the first question, we also stressed that any answers given by the subject would not affect the probability of impeachment in any way. The exposed scenario was as follows:

> *Suppose that the federal election committee has launched an investigation toward the elected president due to a corruption scandal. According to the retrieved evidence so far, there is a 0.5 probability that the president is guilty, and conversely, 0.5 that the president is not. If the president is convicted guilty, there is a 0.7 probability that the president is going to be impeached.*

According to the Bayes rule, the objective probability of the presidential impeachment, *given the news is corre*ct would be approximately 90 per cent. Subjects then were asked the following question:

> Q2: *Given that the news is true, how likely do you think the president will be impeached?*

Subjects were able to state any integer (per cent) from 0 to 100, with increments of 1. This scoring rule was adopted from Offerman et al. (2009) where subjects subjective probability is evaluated to an objective probability, calculable from the provided information. The closer their answer to the objective probability, the higher the payoff that they would obtain. For simplicity, the payoff of this question would follow a step-wise function that simplifies a quadratic scoring rule. Each subject was able to obtain up to 50 points from this elicitation, and no points were deducted from

inaccuracy. From this point onward, we will refer to this question as Q2. To sum up, the following table provides a summary of the experimental flow of this study.

Table 2. Experimental Flow

<table>
<tr><td></td><td>Control</td><td>Treatment</td></tr>
<tr><td rowspan="5">Stage 1</td><td colspan="2">Welcome Screen</td></tr>
<tr><td>Instructions:
+ Everybody cannot vote
+ Payoff structure (of stage 1 only)</td><td>Instructions:
+ Everybody can vote
+ Payoff structure (of stage 1 only)</td></tr>
<tr><td colspan="2">Reveal each subjects' assigned candidate preference</td></tr>
<tr><td>No voting</td><td>Voting</td></tr>
<tr><td colspan="2">Voting outcome + Materialised payoff</td></tr>
<tr><td rowspan="4">Stage 2</td><td colspan="2">Dissonant news on winning candidate, the potential of impeachment</td></tr>
<tr><td colspan="2">Q1: Non-Incentivised Belief Elicitation</td></tr>
<tr><td colspan="2">Q2: Incentivised Belief Elicitation
+ Payoff structure (of this question only)</td></tr>
<tr><td colspan="2">Impeachment outcome + Materialised payoff</td></tr>
<tr><td rowspan="2">Post-Game</td><td colspan="2">Total Earnings</td></tr>
<tr><td colspan="2">Post-Questionnaire</td></tr>
</table>

It should be noted that subjects receive no prior information on any upcoming task that they would perform. It means that any decision made on stage 1 was designed not to be influenced by expectations of future events on stage 2. The same principle also applies to Q1 and Q2—subjects had no information that they would answer a question of incentivised belief after answering the non-incentivised question. Please refer to appendix 3 to obtain the English translation of the experimental instruments.

At the end of the game, subjects were informed on the outcome of the impeachment process, as well as their payoff. The total payoff then would be the sum of show up fee, the payoff from election and payoff from incentivised belief elicitation. Points were rounded that every 10 points would equal to 10,000 rupiahs (approximately 60-euro cents). Subjects then asked to fill a post-questionnaire that contains necessary demographic information, and then they were allowed to leave the room and claim immediate cash payment at the cashier.

IV. Data and Result

This study is conducted in a laboratory setting where participants interact with the instrument via a computer terminal. We use the oTree platform (Chen et al., 2016) for the construction and database management of our instruments. The laboratory experiment was initially planned to be conducted on 23, 24 and 25th of May, 2018. Subjects were undergraduate students of Gadjah Mada University from various major. The subjects were randomly invited from a pool of registrants. However, out of 150 invitations sent, only 93 subjects were present, and two sessions that involve control groups had to be cancelled due to a *force majeure* condition.[9] In total, there are two control sessions and four treatment sessions. The sample consists of 45 males and 48 females, with an average age of 20.65 years old. Youngest sample age is 19 years old, while the oldest sample age is 22 years old. In this case, all samples were eligible for voting according to Indonesian law, since the law set the legal voting age of 17 years old. Our induced preferences would expect to see that subjects vote for their assigned candidate preferences. All but one sample choose according to their assigned preferences. It suggests that most of our samples behaved accordingly to their induced preference, and no intentional strategic behaviour was observed.

IV.A. Descriptive Statistics

Our analysis starts with the summary statistics of key interest variables, which are the subjective probability estimations. The data is based on answers given on question 1 (non-incentivised) and question 2 (incentivised). Following is the summary statistics table of both variables.

Table 3. Descriptive Statistics

	All		Treatment (Voting)		Control (No vote)		Win		Lose	
Quest.	**Q1**	**Q2**	**Q1**	**Q2**	**Q1**	**Q2**	**Q1**	**Q2**	**Q1**	**Q2**
count	93	93	61	61	32	32	45	45	48	48
mean	52.591	52.333	50.344	54.049	56.875	49.063	34.6	47.4	69.458	56.958
std	27.589	22.121	28.294	22.291	26.088	21.764	21.141	23.509	21.703	19.883
min	0	0	0	0	8	5	0	0	20	10

[9] In the afternoon before the day when the last two sessions were supposed to be run, the nearby volcano (Gn. Merapi, Yogyakarta, 24 May 2018) had a small eruption that created a rain of ashes which disabled the transportation network for several hours until the following morning in most of the city. Only three participants attended the schedule, and all three were provided with the show-up fee only.

25%	30	35	25	36	30	30	20	30	59.75	40.5
50%	51	57	50	60	59.5	56	35	50	70	60
75%	75	70	70	70	75	70	50	70	88.5	70
max	100	100	100	100	100	85	75	100	100	100

Table 3 provides the summary statistics for both belief elicitation questions, grouped by treatment conditions and win conditions. While treatment conditions distinguish whether an individual can vote or not, win conditions capture whether the supported candidate for a given individual wins the election, regardless of their actual vote or voting ability. Since there are an almost identical number of supporter A and supported B, the number of subjects that fall in the win and lose conditions will be close to equal. Using Mann-Whitney U test, it is found that there are no statistical differences at any standard alpha level between answers from control and treatment group, for both questions 1 ($p = 0.160$) and question 2 ($p = 0.177$). On the other hand, responses between a win and lose conditions are statistically different (Q1: $p = 0.000$, Q2: $p = 0.035$) at 5 per cent alpha.

By comparing both question 1 and question 2 results under win and lose conditions, it is found that subjects whose had won the election on average provide a lower probability estimation of impeachment than those who had lost the election. This result shows that the data has been in line with findings from previous literature (e.g. Mullainathan and Washington, 2009) regarding belief polarisation in general, where voters with different political preferences exhibit different opinion after observing identical information, apart from their eligibility to vote. We can also see that the distance of mean of stated probability between the win and lose conditions are also smaller for incentivised belief elicitation, and the overall standard deviation is smaller for question 2 (22.121) than question 1 (27.589). This result is also consistent with Gatcher and Renner (2010) findings, which provides some indication that belief statement is less noisy under incentivised elicitation.

Since our hypothesis was based on interaction conditions between treatment and win conditions, it is essential to do some extra exploratory data analysis involving these conditions. Note that the outcome of the election is symmetrical since all subjects would receive similar payoff structure, regardless of their candidate preference. Thus, it is safe to say that the win condition of candidate A is identical to B.

Table 4. Cross-Condition Descriptive Statistics

Condition:	(1)	(2)	(3)	(4)

		Voting and Win	Voting and Lose	No vote and Win	No vote and Lose
Variable:		**Question 1**			
count		30	31	15	17
mean		34.3	65.870968	35.2	76
std		23.472875	23.70477	16.209345	16.112883
min		0	20	8	51
	25%	19.25	50	25	60
	50%	38	70	30	70
	75%	53	82.5	45	90
max		75	100	75	100
Variable:		**Question 2**			
count		30	31	15	17
mean		47	60.870968	48.2	49.823529
std		23.646827	18.853367	24.03331	20.27386
min		0	10	5	25
	25%	30	52.5	28	30
	50%	45.5	60	60	46
	75%	69.25	70	68	70
max		100	100	75	85

The table above explains several summary statistics of question 1 and question 2 responses. In this table, we distinguish summary statistics for each different conditions of subjects. In total, we have four primary type of subjects based on interaction terms (treatment condition *x* win condition). Condition 1 (*Voting and Win*) refers to subjects who were able to vote, and the whose supported candidate had won the election, regardless of induced preferences. Condition 2 (*Voting and Lose*) consists of those who were able to vote, but then their supported candidate had lost the election in a particular session. Condition 3 (*No vote and Win*) and 4 (*No vote and Lose)* refers to the control groups that were not able to vote, and those whose supported candidate had won the election and lost the election, respectively.

Here, we can see that both responses appear to have similarities and differences. Before any statistical tests, we can see that losers tend to provide a larger estimation than winners in both control and treatment condition, again in line with findings from the previous literature. Notably, the result of Q1 provides an intriguing finding. Even under a condition where belief was not incentivised, answers do not affect any form of payoff and preferences were induced; we still observe a diverging belief statement between winning and losing subject.

An interesting result can be seen if we compare how treatment and control conditions provide a different effect on Q1 and Q2. In Q2, we observe that subjects in treatment condition provide a more polarised opinion than those in the control group. Here, the distance between means of

winner and loser in treatment condition is larger than the distance of means in control condition and is following the hypotheses. However, the same result does not hold for Q1, where we can see that subjects in the control condition always state a higher probability than in treatment, given their win condition. Nevertheless, this evidence is yet to be tested formally, thus preventing us from drawing any conclusion about the hypothesis.

At this point, it is helpful to obtain some information related to the relationship between non-incentivised belief elicitation and the incentivised one since both type of beliefs is measured on every subject. Firstly, we observe the correlation between Q1 and Q2. Upon inspection, the data shows a Pearson coefficient of 0.3472, implying a weak positive correlation between the two measures. Two-tailed Wilcoxon test was also conducted to observe whether there are differences in responses between Q1 and Q2. It provides a p-value of 0.8716, which means that both medians are not statistically different, or we can say that both came from the same distribution.

Even though Q1 provides evidence of belief polarisation between winning subjects and losing subjects, it does not show any support for our primary hypothesis in which voting amplifies belief polarisation. Since Q1 overall comes with a higher standard deviation, with no difference in means and no statistical difference among interaction groups of interest, we can conclude that non-incentivised elicitation contains is relatively more noisy measure compared to incentivised belief.

On the other hand, descriptive statistics of question 2 indicates support toward the hypothesis. On the incentivised belief elicitation, we can see that the data are parallel in both hypotheses HA1 and HA2. Condition 1 only had a marginally lower mean compared to condition 3, whereas condition 2 exhibit a higher mean compared to condition 4. Before running any statistical test, the data from question 2 is consistent with both our alternative hypothesis. Statistical tests are provided on the upcoming result section of this paper.

IV.B. Power Analysis

Before we jump into the statistical test of our hypothesis, it would be helpful to have some insight on how much statistical power the result would have given the obtained data. A post-hoc power analysis is conducted on a different comparison of our data. Computed statistical power would be one minus the probability for having a type II error on our hypothesis testing. A post-hoc power analysis is a method of statistical power computation after a study has been conducted,

where $1 - \beta$ is calculated as a function of significance level (α), sample size and effect size (Faul et al., 2007).

Our hypothesis primarily compares posterior probability between subjects in treatment and control group, given a similar election outcome for a particular subject. Thus, the post-hoc power analyses were run on several relevant groups: Condition 1 versus Condition 3 (Treatment and Win vs Control and Win), and Condition 4 versus Condition 2 (Treatment and Lose vs Control and Lose). Post-hoc power analyses were done on G*Power software (Faul et al., 2007), using a t-test as the test family on the comparison of independent means from two groups. A typical alpha level of 0.05 was chosen, and effect size is calculated using Cohen's d[10]. Table X. provides the summary of post-hoc power analysis.

Table 5. Post-Hoc Power Analysis

	n Group 1	n Group 2	Effect size	Alpha	Statistical Power
Question 1 - Non-incentivised belief					
Treat. Win vs Cont. Win	30	15	0.05	0.05	0.068
Treat. Lose vs Cont. Lose	31	17	0.505	0.05	0.501
Question 2 - Incentivised belief					
Treat. Win vs Cont. Win	30	15	0.068	0.05	0.075
Treat. Lose vs Cont. Lose	31	17	0.564	0.05	0.577

The result of post-hoc power analysis indicates that there are some disparities of statistical power between outcome conditions, on both incentivised and non-incentivised belief elicitation. Despite not achieving an outstandingly high number, statistical power obtained from win condition is very small compared to the lose condition. For instance, lose condition outperforms win condition by around 0.43 on the first question, whereas this number is slightly higher at 0.502 in the incentivised belief elicitation. These results would provide a strong indication that we would observe a more pronounced effect on the lose condition. However, in general, the result also indicates that the data is underpowered. The small sample size is the primary suspect that contributes to this lack of statistical power.

[10] An intuition behind effect size can be seen in Cohen (1992), where effect size is determined by the formula of the ratio of the difference in mean between groups against the standard deviation of either group. In his paper, he classifies 0.2 as 'small' effect size and 0.5 as 'large'.

IV.C. Hypothesis Testing: Statistical Tests of Means and Distribution

Hypothesis testing is done by using both parametric and non-parametric statistical tests. One advantage of a non-parametric test is that it does not assume that the data is drawn from a specific probabilistic distribution. Considering that we are comparing subjective probabilities in our data, a non-parametric test would need the less restrictive assumption that accommodates human imprecision on this data generating process (Hogarth, 1975). However, we cannot disregard the efficiency of a parametric test as well. Recall our two sub-hypotheses, restated on the null form that fits parametric test:

> H01: Voters in treatment group whose candidate were elected *does not* have a *lower* stated posterior probability of elected president impeachment than voters in control group whose candidate was elected.
>
> H02: Voters in treatment group whose candidate were *not* elected *does not* have a *higher* stated posterior probability of elected president impeachment than voters in control group whose candidate was *not* elected.

For non-parametric tests, the null hypotheses are slightly different since non-parametric methods test over differences in distributions, not means. The following null hypotheses are the non-parametric version over the two mentioned above:

> H01: The distribution of stated posterior probability of elected president impeachment for both voters in control and treatment group whose candidate *were* elected comes from a same distribution.
>
> H02: The distribution of stated posterior probability of elected president impeachment for both voters in control and treatment group whose candidate *were not* elected comes from a same distribution.

Firstly, we look at the non-incentivised belief elicitation (Q1). Here, we see that the mean subjective probabilities are always higher on the control group compared to the treatment group, regardless of whether they won or lost the election. Despite this contradictory result, a non-parametric statistical test (two-tailed Mann-Whitney U test) show that these apparent differences are not significant. The test statistics shows a p-value of 0.4807 (parametric p-value: 0.4474) for comparison between condition 1 against condition 3, and 0.8809 (parametric p-value: 0.9384) for comparison between condition 2 against condition 4, which shows no statistical significances at any standard alpha level.

For hypothesis testing, we turn into a one-sided statistical test. Both parametric and non-parametric tests of Q1 data shows no evidence to reject the null hypothesis. It shows that we do

not observe different responses across interaction groups of interest, implying that responses for non-incentivised belief elicitation were as good as random. We can also conclude that we do not have enough evidence to reject both H01 and H02 based on the non-incentivised belief data alone.

Table 6. P-Values of One-Sided Mann-Whitney U Test and T-Test

	(1) Voting win vs (3) No vote win		(2) Voting lose vs (4) No vote lose	
	H01 (P vote, win < P no vote, win)		H02 (P vote, lose > P no vote, lose)	
	Non-Parametric	Parametric	Non-Parametric	Parametric
Q1	0.4807	0.4474	0.8809	0.9384
Q2	0.4519	0.437	0.0557*	0.0325**

However, as mentioned in the previous section, our main interest variable lies in the incentivised belief elicitation or Q2. Again, we test both hypotheses For H01; the left-tailed U test results in a p-value of 0.4519, which means that there is no statistical difference between the mean of stated subjective probabilities between two groups for samples that has their candidate winning. Turning into a parametric t-test does not provide any different conclusion, where the parametric p-value is at 0.437. Thus, we do not have evidence to reject the null hypothesis H01. On the H02, the one-tailed Mann-Whitney U test shows a p-value of 0.055. This number means that given the null hypothesis is true, the differences we see in the data would only occur around 5.57 per cent due to random chances; thus, the observed data is statistically significant at 10 per cent alpha, and we can reject our second null hypothesis. The parametric t-test even yields a stronger statistical significance, where it obtains a p-value of 0.0325 or significant at 5 per cent alpha. The data has shown support only partially toward the main hypothesis after combining these two results.

IV.D. Hypothesis Testing: Regression

To allow us more control over possible factors that may influence subjective probability estimation of participants, we opt to complement our statistical tests with an OLS regression analysis. The following model was specified following our hypothesis testing.

$$Y_i = \beta_0 + \beta_1 Voting_i + \beta_2 Lose_i + \beta_3 Voting_i * Lose_i + \beta_X X_i$$

On the left-hand side is the dependent variable, which is incentivised belief elicitation. Explanatory variables are the voting dummy, lose dummy, voting and lose interactions and X_i

which represents a vector of control variables. Two conditions are required for the rejection of our null hypothesis: 1) to reject H01, we need to observe a negative and significant β_1 coefficient, and 2) to reject H02, we need to observe a positive and significant β_3 coefficient. Some control variables that we would include in the estimation are demographic factors (gender and age) and non-incentivised response, that was asked before incentivised belief elicitation. Since we observe a positive, despite the weak relationship between Q1 and Q2, the non-incentivised belief might have some explanatory role on incentivised belief. If we assume that Q1 contains the noisy part of belief elicitation, then adding Q1 into the regression model would allow us to control this noise and observe the true effect of voting.

Table 7. Ordinary Least Squares Regression Analysis

Dependent Variable: Incentivised Response	Model (1)	Model (2)	Model (3)	Model (4)
β_1: Voting dummy	-1.200	-0.913	-0.847	-1.176
	(6.832)	(6.520)	(6.561)	(6.587)
β_2: Lose dummy	1.624	-11.39	-11.29	-11.10
	(7.653)	(8.410)	(8.466)	(8.486)
β_3: Voting and Lose	12.25	15.19*	15.08	15.45*
	(9.444)	(9.061)	(9.122)	(9.153)
Non-Incentivised Response		0.319***	0.320***	0.311***
		(0.102)	(0.103)	(0.104)
Age			0.490	0.730
			(2.010)	(2.036)
Gender dummy (Male:1)				-3.537
				(4.395)
Constant	48.20***	36.97***	26.74	23.94
	(5.578)	(6.425)	(42.42)	(42.65)
Observations	93	93	93	93
R-squared	0.077	0.169	0.170	0.176
F-statistics	0.0660	0.00243	0.00566	0.00921

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table X represents the OLS regression result for four different specifications of the model. In the first model, we only include the treatment condition dummy, lose condition dummy and interaction dummy. In the second model, we add the response from the non-incentivised question. Third and fourth models further add a demographic variable, which is age and gender, respectively. Three standard alphas were chosen to indicate the significance level.

Several post-regression diagnostics tests were also run to test the OLS assumption.[11] Model (2) was chosen as the basis for diagnostic tests since it has the best goodness-of-fit regarding F-statistics. Firstly, the normality of residuals assumption was tested via the Shapiro-Wilk W test. The test returns a p-value of 0.9612, indicating that the distribution of residuals is not different from a normal distribution. Secondly, we test for model specification. A Ramsey RESET test would allow us to see whether there is an omitted variable in our model. The p-value of this test is at 0.7293, meaning that the test fails to reject the null hypothesis that there is no specification error in the model. Lastly, we test for homoscedasticity assumption via the White procedure. A p-value of 0.2831 indicates that the homoscedasticity assumption is not rejected. Overall, the diagnostic tests suggest that OLS standard assumptions are fulfilled in our estimation.[12]

Under all of four model specifications, it is revealed that β_1 coefficients are negative and β_3 coefficients are positive. In all models, we did not observe statistical significance at any level of alpha for β_1 coefficients, which is in line with the result from our Mann-Whitney U test explained in the previous section. Meanwhile, we did observe statistical significance at 10 per cent alpha for β_2 coefficient only in the model (2) and model (4).

On other control variables, we do not see any effect from age and gender. This is expected since the sample is relatively homogenous and we do not have wide variances in age. Interestingly, we also observe a high significance level for non-incentivised response in all models, which is at 1 per cent alpha. Since the addition of Q1 improves F-statistics, R-squared in all models and some significance level in our coefficient of interests, we can conclude that inclusion of Q1 answers allows us to observe a more precise relationship caused by voting and losing.

V. Conclusion

V.A. Discussion

The research question of this study is to examine further the causal relationship between the mere act of voting and belief polarisation under the cognitive dissonance theory without involving any socio-political cues that plague the result of the previous study. Understanding belief polarisation without involving these socio-political cues is significant for economics, psychology and political sciences since it allows us to establish a more definite link on how behaviour can affect preferences, especially in political activities such as voting without any effect of confounding factors. This study uses an experimental approach that simulates bipartite

[11] Post-regression tests are run based on the suggestion from Cameron and Trivedi (2010).
[12] For all details regarding the post-regression diagnostics test, please refer to appendix 2.

presidential election and incentivising subjects symmetrically to avoid a hypothetical voting situation. Subjects were making decisions within a controlled and isolated environment in the laboratory. Subject's political preferences were induced, and incentives were designed based on spatial preferences. Cognitive dissonance framework was used in providing stimulus on changes in preferences, which is measured then by subjective probability estimation by subjects. We expect that voting amplifies the probability estimation to lean toward a more extreme value based on whether they won the election or not—those who votes are expected to provide a more extreme probability estimation than those who are not voting. The result provides only partial support for our hypothesis. After being exposed with an identical dissonant condition, belief polarisation is observed only on subjects whose candidate had lost under a simulated election, as subjects who were able to vote to tend to state a higher probability of impeachment toward the winning candidate. On the other hand, there were no differences in responses by subjects that had their candidate won in both the control and treatment group.

Our initial idea of how cognitive dissonance gives rise to political polarisation was based on the focus of generating dissonance or consonance condition to voters, which are expected to affect their posterior belief. Even though our model's predictions correspond with empirical literature on political belief polarisation, our experimental results do not appear to be fully supportive of the model. This disparity rises call to evaluate our model and an attempt to seek for an alternative explanation.

Our model constructs a conflict between the participant's cognition, which is obtained via election, against the state of the world, which is the dissonant news. Recall the central idea of cognitive dissonance; when two cognitive elements are conflicting against one another in one's mind, this creates a dissonance condition which in turn tempt an individual to evaluate and change their perception on one of either conflicting elements. This notion implies that no dissonance would occur when none of the two elements is conflicting with the other. Instead, our result suggests that for subjects that won the election, no difference is observed, implying that there is also no difference in dissonance effect generated by voting. Meanwhile, a difference is found between voting conditions for subjects that lost the election, suggesting that voting generates different dissonance effect on this group.

Such asymmetric finding on cognitive dissonance research is not new, though. A study, done by Cooper and Brehm (1971), also observed similar evidence, where some treatment groups did not experience dissonance while some others did. They formulated some preconditions of cognitive dissonance; when subjects have information over the possibility of having a worse payoff and

perceive that they were responsible for such adverse outcome, dissonance was more pronounced. It leads us to think that there might be different conflicting elements that were occurring under our design, instead of what was expected from our model.

Alternatively, one can think of intentions versus result as the two main conflicting elements. In this alternative view, cognitive dissonance occurs when one's intention of winning the election conflicts with the result of the election itself. In this way, dissonance occurs only for subjects who lost the election since their intentions (of winning the election) were not aligned with the election outcome. Subjects who had won the election did not experience this misalignment. This alternative view is in accordance to the new look paradigm of cognitive dissonance theory, promoted by Cooper and Fazio (1984) as a follow-up argument for Cooper and Brehm (1971). This alternate view of the theory argues that cognitive dissonance only occurs in exceptional circumstances, which is when an adverse outcome results from an event that is within one's internal locus of causation. In other words, when an adverse outcome of an event is conceived as a consequence of one's action, it would lead to cognitive dissonance.

Under this new look paradigm, two conditions are necessary for this type of dissonance to occur; firstly, an action should be done under no coercive circumstances, or individuals should perceive that they have freedom over choices they made[13]. Secondly, this adverse outcome should be anticipated by individuals, or in other words, they know the possibility of this undesirable result. In addition to the adverse outcome, we now have three necessary conditions that give rise to cognitive dissonance: 1) freedom of choice, 2) anticipation of and 3) materialisation of adverse outcome. Our design fulfils this freedom of choice condition since we control for subjects' ability to vote and they were able to cast any vote to any candidate, despite the lack of possibility for absenteeism. As our main interest variable, we indeed found that the presence of control over the result of the election (as in treatment condition) amplifies the cognitive dissonance compared to the absence of control (as in control group). Anticipation condition is also present since we provide information about each possible payoff of each election result. The materialisation of adverse outcome also presents and experienced only by subjects in lose conditions. Therefore, the theory predicts that dissonance condition only occurs on losing subjects, meanwhile winning participants are not subject to dissonance since they did not experience any adverse outcome. We also need to mention that, although there is a risk of obtaining lower (or higher) payoff before dissonant condition, all participants in both treatment group and win conditions are subject to

[13] Some evidence that borne out this notion: Cooper and Brehm (1971), Collins and Hoyt (1972).

this risk. Since they have no control over the probability over this risk of impeachment, according to the new look paradigm, it would not generate any dissonant condition.

This framework provides a better explanation of our results than our model which is based on Festinger's (1957) that implies symmetry between those who do not experience adverse outcome (winning subjects) and those who do (losing subjects). Under this new look, the role of presupposed 'dissonant' information—in our model, corruption news—is reduced to a mere measurement instrument instead of the source of dissonance itself.

However, the fact that original theory does not provide a good explanation over our result does not necessarily mean that we should abandon the original idea. The fact that there is various empirical evidence that support Festinger's theory cannot be neglected. Instead, we can interpret our findings as an explanation of how the mere act of voting contributes to political polarisation. Cognitive dissonance in voting itself is not the sole cause of political polarisation in an election; other factors such as party sorting (Fiorina and Abrams, 2008), elite polarisation (Hetherington, 2001) and spatial segregation (Walks, 2010) also contribute. In this occasion, the result of our study aims to provide an explanation only regarding on the voting channel, among many other channels, which contributes to this political polarisation phenomenon, not democratic voting as a whole socio-political process.

V.B. Limitations and Further Studies

This study aims to provide a clear understanding of how voting contributes to the cognitive dissonance that in turn amplify belief polarisation. However, we do not neglect the fact that this study has exhibited several limitations. Firstly, post-hoc power analysis shows that the tested hypotheses were having a relatively low statistical power, which means that the probability for false rejection of the null hypothesis is substantial. This is most probably due to the lack of samples obtained during this study. For example, to obtain a sizeable statistical power (beta of 20 per cent) given the effect size of 0.565, *a priori* power analysis suggests that we would need around 40 samples for each control and treatment group, for each win condition. Secondly, the construct of polarisation ideally should be measured by comparing the posterior belief against prior belief. However, in this research the prior belief of dissonant information is unobservable by nature; therefore, it has relied on a strict assumption that all subjects have an identical distribution of prior belief. It leads to the consequence that this design does not allow absolute measurement of belief polarisation. Therefore, it limits our claim of belief polarisation into a relative comparison, while the absolute value is unknown.

Following the previous discussion part, we observed that our result could be better described by the new look paradigm of cognitive dissonance theory. Our study, however, does not serve as a direct test over this alternative framework. Nevertheless, this insight has enlightened several potential areas for further research, particularly in the incorporation of new look paradigm for further explanation of political polarisation. One could have research that studies how each of the three prerequisites of cognitive dissonance amplifies the effect of belief polarisation. For example, how does the magnitude of adverse outcome, determined by different distances in the political spectrum, amplifies the effect of cognitive dissonance? Another possible research area is also on polarisation within a multiparty election, which is among existing systems in several countries. The result of this study also contributes to the literature of cognitive dissonance, in which it provides further experimental evidence for the evaluation of cognitive dissonance mechanism. Since our result has provided only partial support for the original cognitive dissonance theory, does it mean it is time to reconsider the new look paradigm? Such question illustrates an example from vast further research opportunities in this area.

References

Anduiza, E., Gallego, A., & Muñoz, J. (2013). Turning a blind eye: Experimental evidence of partisan bias in attitudes toward corruption. *Comparative Political Studies*, *46*(12), 1664-1692.

Anspach, N. M. (2017). The new personal influence: How our Facebook friends influence the news we read. *Political Communication*, *34*(4), 590-606.

Beasley, R. K., & Joslyn, M. R. (2001). Cognitive dissonance and post-decision attitude change in six presidential elections. *Political Psychology*, *22*(3), 521-540.

Bem, D. J. (1967). Self-perception: An alternative interpretation of cognitive dissonance phenomena. *Psychological review*, *74*(3), 183.

Black, D. (1948). On the rationale of group decision-making. *Journal of political economy*, *56*(1), 23-34.

Blais, A., & Young, R. (1999). Why do people vote? An experiment in rationality. *Public Choice*, *99*(1-2), 39-55.

Bølstad, J., Dinas, E., & Riera, P. (2013). Tactical voting and party preferences: A test of cognitive dissonance theory. *Political behavior*, *35*(3), 429-452.

Cameron, A. C., & Trivedi, P. K. (2010). *Microeconometrics using stata* (Vol. 2). College Station, TX: Stata press.

Chen, D. L., Schonger, M., & Wickens, C. (2016). oTree—An open-source platform for laboratory, online, and field experiments. *Journal of Behavioral and Experimental Finance*, *9*, 88-97.

Cohen, J. (1992). A power primer. *Psychological bulletin*, *112*(1), 155.

Collins, B. E., & Hoyt, M. F. (1972). Personal responsibility-for-consequences: An integration and extension of the "forced compliance" literature. *Journal of Experimental Social Psychology*, *8*(6), 558-593.

Cook, J., & Lewandowsky, S. (2016). Rational irrationality: Modeling climate change belief polarization using Bayesian networks. *Topics in cognitive science*, *8*(1), 160-179.

Cooper, J., & Brehm, J. W. (1971). Prechoice awareness of relative deprivation as a determinant of cognitive dissonance. *Journal of Experimental Social Psychology*, *7*(6), 571-581.

Cooper, J., & Fazio, R. H. (1984). A new look at dissonance theory. In *Advances in experimental social psychology* (Vol. 17, pp. 229-266). Academic Press.

Davis, O. A., Hinich, M. J., & Ordeshook, P. C. (1970). An expository development of a mathematical model of the electoral process. *American political science review*, *64*(2), 426-448.

Dickerson, C. A., Thibodeau, R., Aronson, E., & Miller, D. (1992). Using cognitive dissonance to encourage water conservation. *Journal of Applied Social Psychology*, *22*(11), 841-854.

Dinas, E. (2012). The formation of voting habits. *Journal of Elections, Public Opinion & Parties*, *22*(4), 431-456.

Domínguez, J. I., & McCann, J. A. (1998). *Democratizing Mexico: Public opinion and electoral choices*. JHU Press.

Eagly, A. H., & Chaiken, S. (1993). *The psychology of attitudes*. Harcourt Brace Jovanovich College Publishers.

Edwards, K., & Smith, E. E. (1996). A disconfirmation bias in the evaluation of arguments. *Journal of Personality and Social Psychology*, *71*(1), 5.

Enelow, J. M., & Hinich, M. J. (1984). *The spatial theory of voting: An introduction*. CUP Archive.

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior research methods*, *39*(2), 175-191.

Ferejohn, J. A., & Fiorina, M. P. (1974). The paradox of not voting: A decision theoretic analysis. *American political science review*, *68*(2), 525-536.

Festinger, L. (1962). *A theory of cognitive dissonance* (Vol. 2). Stanford university press.

Festinger, L., & Carlsmith, J. M. (1959). Cognitive consequences of forced compliance. *The journal of abnormal and social psychology*, *58*(2), 203.

Fiorina, M. P., & Abrams, S. J. (2008). Political polarization in the American public. *Annu. Rev. Polit. Sci.*, *11*, 563-588.

Forsythe, R., Myerson, R. B., Rietz, T. A., & Weber, R. J. (1993). An experiment on coordination in multi-candidate elections: The importance of polls and election histories. *Social Choice and Welfare*, *10*(3), 223-247.

Frey, B. S., & Schneider, F. (1978). A politico-economic model of the United Kingdom. *The Economic Journal*, *88*(350), 243-253.

Fried, C. B., & Aronson, E. (1995). Hypocrisy, misattribution, and dissonance reduction. *Personality and Social Psychology Bulletin*, *21*(9), 925-933.

Gächter, S., & Renner, E. (2010). The effects of (incentivized) belief elicitation in public goods experiments. *Experimental Economics*, *13*(3), 364-377.

Garcia, D., Mendez, F., Serdült, U., & Schweitzer, F. (2012, November). Political polarization and popularity in online participatory media: an integrated approach. In *Proceedings of the first edition workshop on Politics, elections and data* (pp. 3-10). ACM.

Gbadamosi, A. (2009). Cognitive dissonance: The implicit explication in low-income consumers' shopping behaviour for "low-involvement" grocery products. *International Journal of Retail & Distribution Management*, *37*(12), 1077-1095.

Goetzmann, W. N., & Peles, N. (1997). Cognitive dissonance and mutual fund investors. *Journal of Financial Research*, *20*(2), 145-158.

Gross, K. (2008). Framing persuasive appeals: Episodic and thematic framing, emotional response, and policy opinion. *Political Psychology*, *29*(2), 169-192.

Hetherington, M. J. (2001). Resurgent mass partisanship: The role of elite polarization. *American Political Science Review*, *95*(3), 619-631.

Hill, S. J. (2017). Learning together slowly: Bayesian learning about political facts. *The Journal of Politics*, *79*(4), 1403-1418.

Hinich, M. J., & Pollard, W. (1981). A new approach to the spatial theory of electoral competition. *American Journal of Political Science*, 323-341.

Hogarth, R. M. (1975). Cognitive processes and the assessment of subjective probability distributions. *Journal of the American statistical Association*, *70*(350), 271-289.

James, G., Witten, D., Hastie, T., & Tibshirani, R. (2013). *An introduction to statistical learning* (Vol. 112). New York: springer.

Jern, A., Chang, K. M. K., & Kemp, C. (2014). Belief polarization is not always irrational. *Psychological review*, *121*(2), 206.

Jern, A., Chang, K. M., & Kemp, C. (2009). Bayesian belief polarization. In *Advances in neural information processing systems* (pp. 853-861).

Kahneman, D., & Tversky, A. (1972). Subjective probability: A judgment of representativeness. *Cognitive psychology*, *3*(3), 430-454.

Kelly, T. (2008). Disagreement, dogmatism, and belief polarization. *The Journal of Philosophy*, *105*(10), 611-633.

Klaczynski, P. A. (2000). Motivated scientific reasoning biases, epistemological beliefs, and theory polarization: A two-process approach to adolescent cognition. *Child Development*, *71*(5), 1347-1366.

Koch, J. W. (1999). Candidate gender and assessments of senate candidates. *Social Science Quarterly*, 84-96.

Konow, J. (2000). Fair shares: Accountability and cognitive dissonance in allocation decisions. *American economic review*, *90*(4), 1072-1091.

Mason, R. L., Gunst, R. F., & Hess, J. L. (2003). *Statistical design and analysis of experiments: with applications to engineering and science* (Vol. 474). John Wiley & Sons.

McDermott, M. L. (1997). Voting cues in low-information elections: Candidate gender as a social information variable in contemporary United States elections. *American Journal of Political Science*, 270-283.

McGregor, R. M. (2013). Cognitive dissonance and political attitudes: The case of Canada. *The Social Science Journal*, *50*(2), 168-176.

Morris, J. S. (2007). Slanted objectivity? Perceived media bias, cable news exposure, and political attitudes. *Social Science Quarterly*, *88*(3), 707-728.

Mullainathan, S., & Washington, E. (2009). Sticking with your vote: Cognitive dissonance and political attitudes. *American Economic Journal: Applied Economics*, *1*(1), 86-111.

Murphy, J. J., Allen, P. G., Stevens, T. H., & Weatherhead, D. (2005). A meta-analysis of hypothetical bias in stated preference valuation. *Environmental and Resource Economics*, *30*(3), 313-325.

Niven, D. (2006). A field experiment on the effects of negative campaign mail on voter turnout in a municipal election. *Political Research Quarterly*, *59*(2), 203-210.

Offerman, T., Sonnemans, J., Van de Kuilen, G., & Wakker, P. P. (2009). A truth serum for non-bayesians: Correcting proper scoring rules for risk attitudes. *The Review of Economic Studies*, *76*(4), 1461-1489.

Olken, B. A. (2007). Monitoring corruption: evidence from a field experiment in Indonesia. *Journal of political Economy*, *115*(2), 200-249.

Pregibon, D. (1980). Goodness of link tests for generalized linear models. *Applied statistics*, 15-14.

Price, V., Tewksbury, D., & Powers, E. (1997). Switching trains of thought: The impact of news frames on readers' cognitive responses. *Communication research*, *24*(5), 481-506.

Prior, M. (2013). Media and political polarization. *Annual Review of Political Science*, *16*, 101-127.

Rijkhoff, Y.S. (2016, August 18). *The Downside of Democracy*. *Economics*. Retrieved from http://hdl.handle.net/2105/34718

Ramsey, J. B. (1969). Tests for specification errors in classical linear least-squares regression analysis. *Journal of the Royal Statistical Society. Series B (Methodological)*, 350-371.

Sanbonmatsu, D. M., Posavac, S. S., & Stasney, R. (1997). The subjective beliefs underlying probability overestimation. *Journal of Experimental Social Psychology*, *33*(3), 276-295.

Sears, D. O., & Freedman, J. L. (1967). Selective exposure to information: A critical review. *Public Opinion Quarterly*, *31*(2), 194-213.

Shapiro, S. S., & Wilk, M. B. (1965). An analysis of variance test for normality (complete samples). *Biometrika*, 52(3/4), 591-611.

Sigelman, C. K., Sigelman, L., Walkosz, B. J., & Nitz, M. (1995). Black candidates, white voters: Understanding racial bias in political perceptions. *American Journal of Political Science*, 243-265.

Smith, V. L. (1976). Experimental economics: Induced value theory. *The American Economic Review*, *66*(2), 274-279.

Staw, B. M. (1976). Knee-deep in the big muddy: A study of escalating commitment to a chosen course of action. *Organizational behavior and human performance*, *16*(1), 27-44.

Stone, J., Aronson, E., Crain, A. L., Winslow, M. P., & Fried, C. B. (1994). Inducing hypocrisy as a means of encouraging young adults to use condoms. *Personality and Social Psychology Bulletin*, *20*(1), 116-128.

Sweeney, P. D., & Gruber, K. L. (1984). Selective exposure: Voter information preferences and the Watergate affair. *Journal of Personality and Social Psychology*, *46*(6), 1208.

Taber, C. S., & Lodge, M. (2006). Motivated skepticism in the evaluation of political beliefs. *American Journal of Political Science*, *50*(3), 755-769.

Taber, C. S., Cann, D., & Kucsova, S. (2009). The motivated processing of political arguments. *Political Behavior*, *31*(2), 137-155.

Towner, T. L., & Dulio, D. A. (2011). An experiment of campaign effects during the YouTube election. *New Media & Society*, *13*(4), 626-644.

Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science*, *185*(4157), 1124-1131.

Von Neumann, J., & Morgenstern, O. (2007). *Theory of games and economic behavior (commemorative edition).* Princeton university press.

Walks, R. A. (2010). Electoral behaviour behind the gates: Partisanship and political participation among Canadian gated community residents. *Area*, *42*(1), 7-24.

Wang, S. W. (2011). Incentive effects: The case of belief elicitation from individuals in groups. *Economics Letters*, *111*(1), 30-33.

White, H. (1980). A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica: Journal of the Econometric Society*, 817-838.

Other Web Sources

Denison, J. http://blogs.lse.ac.uk/politicsandpolicy/populist-personalities-the-big-five-personality-traits-and-party-choice-in-the-2015-uk-general-election/#. Accessed 5th of April, 2018

Blankenhorn, D. https://www.the-american-interest.com/2015/12/22/why-polarization-matters/. Accessed 1st of July, 2018.

Appendix 1

Proof of proposition, adopted from Ferejohn and Fiorina (1974):

$$
\begin{aligned}
&p_1\left\{C-\left(\theta_j^A-x_A\right)^2\right\}+p_2\left\{C-\left(\theta_j^A-x_A\right)^2\right\}+p_3\left\{C-\left(\theta_j^A-x_A\right)^2\right\}\\
&\quad+p_4\left\{\frac{1}{2}\left\{C-\left(\theta_j^A-x_A\right)^2\right\}+\frac{1}{2}\left\{C-\left(\theta_j^A-x_B\right)^2\right\}\right\}+p_5\left\{C-\left(\theta_j^A-x_B\right)^2\right\}\\
&\quad>p_1\left\{C-\left(\theta_j^A-x_A\right)^2\right\}+p_2\left\{C-\left(\theta_j^A-x_A\right)^2\right\}\\
&\quad+p_3\left\{\frac{1}{2}\left\{C-\left(\theta_j^A-x_A\right)^2\right\}+\frac{1}{2}\left\{C-\left(\theta_j^A-x_B\right)^2\right\}\right\}+p_4\left\{C-\left(\theta_j^A-x_B\right)^2\right\}\\
&\quad+p_5\left\{C-\left(\theta_j^A-x_B\right)^2\right\}
\end{aligned}
$$

Since the p1, p2 and p4 terms in both sides are similar, we can ignore them, thus:

$$
\begin{aligned}
&p_3\left\{C-\left(\theta_j^A-x_A\right)^2\right\}+p_4\left\{\frac{1}{2}\left\{C-\left(\theta_j^A-x_A\right)^2\right\}+\frac{1}{2}\left\{C-\left(\theta_j^A-x_B\right)^2\right\}\right\}\\
&\quad>p_3\left\{\frac{1}{2}\left\{C-\left(\theta_j^A-x_A\right)^2\right\}+\frac{1}{2}\left\{C-\left(\theta_j^A-x_B\right)^2\right\}\right\}+p_4\left\{C-\left(\theta_j^A-x_B\right)^2\right\}
\end{aligned}
$$

$$
p_3\left\{\frac{1}{2}\left\{C-\left(\theta_j^A-x_A\right)^2\right\}-\frac{1}{2}\left\{C-\left(\theta_j^A-x_B\right)^2\right\}\right\}+p_4\left\{\frac{1}{2}\left\{C-\left(\theta_j^A-x_A\right)^2\right\}-\frac{1}{2}\left\{C-\left(\theta_j^A-x_B\right)^2\right\}\right\}>0
$$

$$
(p_3+p_4)\left\{\frac{1}{2}\left\{C-\left(\theta_j^A-x_A\right)^2\right\}-\frac{1}{2}\left\{C-\left(\theta_j^A-x_B\right)^2\right\}\right\}>0
$$

Since by nature p_3 and p_4 are always positive, and for a supporter of candidate A $\left\{C-\left(\theta_j^A-x_A\right)^2\right\}>\left\{C-\left(\theta_j^A-x_B\right)^2\right\}$, then naturally the left-hand side of this inequality is always larger than zero.

QED.

Appendix 2

Post-regression diagnostic tests

1st test: Normality Assumption

The Shapiro-Wilk W test (Shapiro and Wilk, 1965) is a post-regression procedure that tests whether the random sample used in the regression comes from a normally distributed population. W statistics compare an index constructed via the covariance, variances and means of a normally distributed sample of size *n* against the actual value of the data. The null hypothesis of this test would be:

H0: Sample x_1, x_2 … x_n comes from a normally distributed population

A higher W value generally means that a variable is more likely to be normally distributed. In the context of the post-regression test, we test the normality of the residuals (r). The following table shows STATA output of the computed W statistics, z-value and p-value. The 0.961 p-value shows that we are unable to reject the null hypothesis at any standard significance level. Thus, we can conclude that the normality assumption in our model is fulfilled.

Variable	Obs	W	V	z	Prob>z
r	93	0.99421	0.45	-1.765	0.96124

2nd test: Variance Inflation Factor for Multicollinearity Test

Variance inflation factor (VIF) is computed via dividing the variance of a coefficient in a multiple regression model against the variance if the model consists of the only single explanatory variable (James et al., 2013). This index explains how much variance of a coefficient would increase in the case of multicollinearity. More severe inflation would indicate that the variable suffers from high multicollinearity.

Variable	VIF	1/VIF
1.d_treat	2.1	0.47634
1.d_lose	3.87	0.258712
Interaction	3.99	0.250482
opinion_q1	1.72	0.580771
Mean VIF	2.92	

A general rule of thumb on interpreting this VIF is that any values that are higher than 10 indicate serious multicollinearity issue and thus require model modifications (Mason et al., 2003). Since none of our variables exhibits VIF value exceeding this common rule of thumb, we can conclude that our model does not suffer from multicollinearity.

3rd test: Tests for Specification Error

A model may contain specification errors when there are one or more relevant variables that happen to be excluded from the specification, or when one or more irrelevant variables happen to be put into the model. When this happens, the model would result in a higher error term and potentially provide an inaccurate conclusion.

Two amongst the most common methods of testing specification errors are Regression Equation Specification Error Test (RESET) test (Ramsey, 1969) or Link test (Pregibon, 1980). Both tests are essentially the same, where both tests have a procedure that re-runs the model with additional explanatory terms. While RESET test adds multiple powered values of predictors as additional terms, Link test adds the squared term of predicted value. For both tests, if there are specification errors, then the newly added squared terms should also be able to predict the dependent variable, meaning that the model might miss an important variable or suffer from functional specification error. Both tests have the following null hypothesis:

H0: The coefficient of the squared term of predicted/predictor variable is equal to zero.

Below is the STATA output for Ramsey RESET test.

Ramsey RESET test using powers of the fitted values of probest_q2
Ho: model has no omitted variables
F(3, 85) = 0.43
Prob > F = 0.7293

From the Ramsey RESET test, we can see that the F statistics resulted on a p-value of 0.7293, which does not allow the rejection of the null hypothesis.

Below is the STATA output for Link test.

probest_q2	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
_hat	0.1249025	2.434693	0.05	0.959	-4.712041	4.961846
_hatsq	0.0081766	0.0226442	0.36	0.719	-0.03681	0.0531633
_cons	22.73319	64.16588	0.35	0.724	-104.7435	150.2099

The coefficient of interest in this model would be the _hatsq, since it represents the squared term of the predicted value. We can observe that this coefficient is insignificant, meaning that we are unable to reject the null hypothesis. From the two specification error tests, we can conclude that our model does not suffer from misspecification.

4th test: Test for Heteroscedasticity

When the variability of a predicted variable systematically differs across the value of predictor variable, we can say that the model suffers from heteroscedasticity issue. It will render a regression not as the best linear unbiased estimator (BLUE) since the variance would not be the lowest and would be inconsistent.

To test whether a model suffers from heteroscedasticity, it is common to use a White test (White, 1980). The procedure of this test consists of estimating the squared term of residuals with predicted values and squared predicted values from the original model as the predictor. The R-squared value of this output is then multiplied with the sample size to obtain the Lagrange Multiplier (LM), which follows the chi-squared distribution. The null hypothesis of this test is that the model has homoscedastic variation.

In STATA, this procedure is easily done by the `imtest, white` command which results as follows:

White's test for Ho: homoskedasticity
against Ha: unrestricted heteroskedasticity

chi2(8) = 9.75
Prob > chi2 = 0.2831

Source	chi2	df	p
Heteroscedasticity	9.75	8	0.2831
Skewness	9.07	4	0.0595
Kurtosis	0.81	1	0.3678
Total	19.63	13	0.105

Here, we can see that Heteroscedasticity test obtains a p-value of 0.2831, which means that we fail to reject the null hypothesis that the model has a homoscedastic variance. Therefore, we can conclude that our model fulfils the homoscedasticity requirement of a BLUE estimator.

Appendix 3

Experimental Instructions

Note: All instruments were initially presented in the Indonesian language. This English version was translated from the final version of the instrument for the illustrative purpose of this report. Red and blue coloured text represents differences in treatment and control instructions.

Stage 1

You are participating in an election game. In this game, we are simulating a democratic voting situation.

As in politics, everyone has their preferences. We will simulate that in this experiment.

In this election, there are two candidates, A and B, that are competing for a presidential spot. Each candidate has their policy ideas. After following their debates on media for months, you feel affiliated with either one of the candidates.

Following are the rules of the game:

Initially, you have an endowment as much as 40 points. It also applies to everyone else.
The exact proportion of candidate A and B supporter is unknown, but close to equal.
Treatment: Voting follows the 50%+1 rule. Candidate with most vote wins the election.In the case of a tie, winning candidate is determined randomly with equal chances. Think of a coin toss.
Control: However, no one in this election can cast any vote.
Winning candidate is determined randomly with equal chances. Think of a coin toss.

From the election process, you can earn points. Each point is worth Rp 1.000 Your total earnings will be the total points you earned, plus the participation fee.

Let's suppose that you like the idea of Candidate **A** (**or B**).

If **A** (**or B**) wins the election, you will have an addition of 40 points.
On the other hand, if **A** (**or B**) loses the election, you will have no additional points.

Treatment: Now it is time to vote. Please wait for all other participants.
Control: Please proceed and wait for all other participants.

Result of Election

The winner of this voting session is **A** (**or B**). You gain 40 points (**or You gain no point**).

Stage 2

Vignette:

> Jakarta–Hot rumour coming in! Following an investigation from the Public Attorney, several pieces of evidence have indicated that the current president involved in a budget fraud for the massive tax cut plan. Our sources inform us that the elected president will be impeached soon and taken off the office!
>
> When asked for comments, the former candidate B (**or A)** responds: "I had some suspicion beforehand that this guy will have a major scandal on his time in the office. People should have known that he is not a clean person."

The investigation process is currently underway. We don't know yet whether the president would be impeached or not. There is a certain amount of chance that the president is impeached, and no one can change nor know that probability. You would be informed of the outcome of the investigation later on.

If the president is impeached, then you will lose all points (**or you lose nothing**) from what you obtained in the previous election. Other players whose support President A will lose their 40 points. But, in turn, a temporary government will take over and implement a middle point policy. It will make everyone obtains 10 points equally, including you. Remember, your answer will not affect the chance of impeachment of the president.

Question (1/2): Given the information above, how likely do you think the president is guilty? We would like to know your opinion.

NEXT PAGE

Take notice of the following information:

- The probability of **President A (or B)** being guilty is xxx per cent.
- This news source is somehow known to be not fully accurate. You know that in the past, this newspaper claims are only xxx per cent true. In other words, their predictions are only correct at the xxx per cent of the times.
- You also know that the chance of the justice system on sentencing punishment, given someone is guilty is only.

Given the information above, please estimate the chance that **A** (**or B**) will be impeached, given this news is true. There is one correct answer to this question between 0–100. The closer your estimate to the correct solution, the higher will be your payoff from this task. You may win a maximum of 50 points on this task. No points will be deducted from any inaccurate answer.

Question (2/2): Now answer this question. How likely do you think the president would be impeached given this news is true?

RESULTS

Impeachment: It has been decided by the Parliament that A **(or B)** needs to be put into inactive status indefinitely, as he is required to follow further investigations by the Public Attorney.

No impeachment: The Parliamentary Assembly has decided that there is not enough support from the public to impeach A **(or B)**. He will remain in the office and proceed with his presidential duty.