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RESEARCH ARTICLE

Incumbent Competition and Private Agenda

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Consider two politicians who decide whether to follow what they believe the electorate wants or choose the option that secures their private gain. Policies are implemented when the politicians reach a unanimous decision. The electorate only rewards a politician when a policy is implemented or when the politician is the only one whose action coincides with the popular decision. The results show that if politicians have good decision-making abilities, sufficiently high payoffs in policy implementation—given moderate private agenda payoffs—push them to implement the popular policy. For very poor decision-making abilities, at sufficiently high policy rewards, politicians vote for the same action to implement a policy regardless of what the electorate wants— converging to a decision that neither provides them with a private benefit nor follows exactly the popular decision. For issues of very high relevance to the electorate, only popular policies are passed.

Keyword: Incumbent competition, popularity, rent-seeking

JEL Classification: D72, D80

Most modern democracies are representative democracies. Under the standard account of representative democracy, a principal-agent relationship exists between the electorate and the politician (Urbinati & Warren, 2008). Delegate representatives reflect the preferences of the constituents (McCrone & Kuklinski, 1979). Direct representation is easiest to implement when the social contract is clear-cut and the public is united in its policy choice and optimizes social welfare. With electoral mechanisms in place, a measure of responsiveness is observed from elected representatives toward their constituents (Urbinati & Warren, 2008).

Although the clear set of expectations and payoff allows for effective monitoring in the traditional principal-agent model, the lack of delineation in rewards and punishments provides opportunities for politicians to misbehave. The public can reward effective politicians and punish ineffective ones through the prospect of reelection. However, the effectiveness of the elections is undermined by information accessibility and the personal preferences of voters.

First, consider the uncertainty over public opinion. The choice a politician must make becomes difficult when there is no clear indication of public opinion. Take, for example, the Reproductive Health Law (RH Law) in the Philippines. The core stipulation of the RH Law, which guarantees universal and free access to contraceptives at government health centers

to the citizens, divided the public so strongly that representatives faced public criticism regardless of which stance they took. It was only after decades of controversy and politicization that the Republic Act No. 10354 on Responsible Parenthood and Reproductive Health was finally enacted on December 18, 2012, and signed into law as the Reproductive Health Law (RH Law) on December 21, 2012 (Cabral, 2014).

Furthermore, if the disincentives of not representing the public are unclear, the politicians may engage in corruption or rent-seeking activity. Although the negative impact of high private agenda or rent on politician attitudes in office has been well documented (Krueger, 1974; Ferejohn, 1986; Rivas, 2013; Di Tella & Franceschelli, 2011), corrupt politicians still manage to secure reelection in more nascent democracies. In Brazil, the Mensalão scandal or the "big monthly payments" scandal hit the government of Lula Da Silva in 2005, with millions of dollars from public funds used to buy votes for legislation favored by the then ruling party, the Working Party (Watts, 2012). Despite the Mensalão scandal, ex-president Lula Da Silva still left office with huge approval ratings ("Brazil 'Mensalao' corruption trial concludes," 2012). In 2021, Lula Da Silva was once more contemplating a run for the presidency in Brazil against President Jair Bolsonaro, with polls suggesting Da Silva is well-placed to defeat Bolsonaro (Phillips, 2021). [1]

The paper explores which policies are implemented when there is uncertainty in public opinion and if the opportunity for rent-seeking exists. The paper contributes to the literature on politicians' responsiveness and public opinion. I attempt to explain the disparity in the expectations of political accountability and the impact of public opinion on policy through an alternative model of popularity for competing politicians. The results of the paper may help explain why there is no consensus on the existing literature on politician responsiveness and public opinion. Although some conclude that public opinion is significant in policy (Page & Shapiro, 1983; Erikson et al., 1989; Burstein, 2003; Hagemann et al., 2017), others find that the influence is not as clear-cut (Manza & Cook, 2002; Page, 2002; Canes-Wrone & Shotts, 2004; Burstein, 2006; Alexandrova et al., 2016). The results show that the responsiveness of the politician to public opinion depends on the salience of the issue, the size of the external incentives or private agenda, and the actions of the competing politicians.

The paper studies a setting wherein two competing politicians make a decision on an issue. The decision is a trade-off between what they believe the electorate wants and the decision in which they stand to receive a private benefit. Both politicians receive a signal on the popular choice. The paper adopts the political agency approach. In the political agency model, voters are perceived as the principal and the politicians as the agents. I introduced a model of relative popularity, where the performance of the incumbent is not measured by the public independently; instead, it is measured in conjunction with the performance of their opponent. Politicians who are perceived to perform well are more popular than politicians who are not. The popularity measure here serves as an indication of prospects in and out of office—the more popular a politician is, the better these prospects are. Depending on the policy rewards, the level of private benefit, and the decision-making ability of the politicians, a coordination or anti-coordination game is played.

The relative popularity framework used to examine the choices of the incumbents introduced in this paper draws from relative performance evaluation theory, which suggests that contract efficiency can be improved by incorporating the performance of comparable agents (Antle & Smith, 1986). I argue that relative performance evaluations can be observed commonly in politics. Empirical evidence supports the comparative nature of assessing politician performance, particularly when both politicians are negatively perceived. Chong et al. (2015) found that corruption decreases voter turnout in general and drives down the support for both the incumbent and challenging party. When all politicians are perceived as corrupt, the electorate overlooks information on corruption and looks at other indicators to assess quality (Svolik, 2013; Pavao, 2018). Furthermore, the "keeping up with the Joneses" perspective has been used across different fields of study in economics (Gali, 1994; Easterlin, 1995; Ljungqvist & Uhlig, 2000; Carlsson et al., 2007). When one tries to "keep up with the Joneses," the individual judges himself according to his relative performance against his peers. I adopt the same mechanism and use this as the measure of incumbent performance. Instead of measuring the performance of politicians independently, the public looks at a politician's performance in relation to the competing politician's performance. More specifically, good politician performance is highlighted when the

competing politician performs poorly. Conversely, bad performance is highlighted when the performance of the competing politician performs well. When the performance of both politicians is equally bad or good, the perception of ineffectiveness or effectiveness is downplayed.

The proposed approach in determining policy choice differs from models of election as I focus only on a binary policy position, and the players are incumbent politicians where election and post-office prospects are maximized by popularity. Seminal works by Black (1948) on the median voter theorem and Downs (1957) indicated that the policy positions of politicians would converge to the Condorcet winner or towards the center, with Black's median voter theorem focusing on a single policy space dimension. Its implications on the analysis of ideological divisions between candidates and its role in the electoral competition have been studied thoroughly (Barro, 1973; Ferejohn, 1986; Alesina, 1988; Aragones et al., 2007; Van Weelden, 2013; Rivas, 2013; Matakos & Xefteris, 2017). However, the analysis of voting and elections have largely been centered on how the condition of reelection affects incumbent decisions. In the traditional incumbent-challenger models, both politicians run under a platform, with the winner implementing their policy of choice without opposition. Through the use of incumbent competition in this model, policy outcomes are no longer decided by a single decision-maker. The policy-making process in this environment provides a better representation of how legislation is made in democratic systems. The binary policy space also provides a clearer representation of the decision-making process for proposed policies in legislation (i.e., for or against).

Furthermore, the use of popularity as an incentive for politicians to follow public opinion avoids the problem of the lame duck politician and still covers the core principle of retrospective voting, wherein politicians are rated based on their past performance. The notion of popularity captures gains during and after holding office. It is another way to exercise accountability through feedback, encompassing public perception of performance in office, similar to retrospective voting.

Evidence on retrospective voting at the state and national levels has been mixed (Kenski, 1977; Abramowitz et al., 1988; Evans & Andersen, 2006), but may be largely due to the focus on the effects of economic outcomes and inflation rates. I assume here that the maximization of popularity drives politicians instead of the threat of non-reelection used widely in existing studies on political accountability (Barro, 1973; Ferejohn, 1986; Wattenberg, 2004; Rivas, 2013; Myatt, 2017). Simply put, I posit that the most popular candidate keeps their seat in office and does away with the reelection process. The use of popularity also allows the accounting for the gains a politician may have upon leaving the seat of power. Politicians shift from having de jure to de facto power (Acemoglu et al., 2004). It is not unusual to observe a politician go through the "revolving door of politics" (Fisman, 2001; Blanes i Vidal et al., 2012; Goldman et al., 2013; Cain & Drutman, 2014; Luechinger & Moser, 2014). The connections politicians make in the office provide them with excellent opportunities post-incumbency, as private firms tend to benefit from high degrees of political connectedness (Khwaja & Mian, 2005; Faccio, 2006; Ferguson & Voth, 2008). If one is perceived as popular, de facto power is stronger, providing increased access to both information and resources.

The paper also looks at a single issue setting to better explore how the relative popularity framework can affect incumbent decision-making. For voters to hold incumbents accountable for their past performance, it has to be measured in areas that incumbents oversee directly (Berry & Howell, 2007; Malhotra & Margalit, 2014). Existing literature have shown that voters do respond to the actions of politicians in office. Downs (1957) suggested that voters simplify the decision-making process to issues more salient to them. Healy and Malhotra (2010) used a tornado incident to study how politicians' perceptions are changed. The findings showed that voters do not blame incumbents for the natural events but reward and punish politicians on how the incident is handled. Besley and Burgess (2002) showed that the effects of public opinion on government responsiveness increase as media reach increases. Empirical results corroborate this as the influence of public opinion on policy has been studied empirically, with the impact changing depending on issue salience and possible competition (King, 2001; Wattenberg, 2004; Myatt, 2017).

I expect different outcomes depending on the issue's salience. When an issue is salient, a politician who deviates from the popular choice, regardless of the opponent's action, is viewed as ineffective. However, when an issue is non-salient, the public

does not care too much about the policy implemented and only notices that a politician is ineffective if the opponent chooses the popular action. The behavior of politicians for non-salient issues can be viewed as an anti-coordination game. Under non-salient issues, a politician who deviates from the popular choice still obtains a popularity payoff from policy implementation if the opponent also deviates from the popular choice.

The results show how a politician's private interests and the electorate's control, in the form of popularity payoffs, affect policy outcomes. Large private benefits are found to increase the propensity of politicians to follow the private option and become dishonest. In terms of electorate controls, the results indicate that increasing the payoff for popular policy implementation makes politicians more likely to follow popular policy for both salient and non-salient issues. My results corroborate the findings of Wattenberg (2004), Burstein (2006), and Myatt (2017), where the impact of public opinion on policy is affected by issue salience. Politicians are more likely to implement popular policies when issues are salient. However, an increased reward in policy implementation when issues are non-salient provides incentives for politicians to collude and decide on one decision without regard to the popular choice. The paper finds that, ultimately, better decision-making ability in politicians makes it more likely for politicians to ignore the private benefit and follow the preferences of the electorate. Better decision-makers have more incentive to be honest as there is less risk in getting the popular choice correctly. Empirical results in India show that education increases the chances of selection to public office and makes politicians less likely to be opportunistic in office (Besley et al., 2005). Overall, the electorate is found to be better off when politicians coordinate.

The model can be used in settings where the actions of politicians can be directly attributed to outcomes: policy implementation or the passing of legislation for legislators and the policy positioning of a coalition majority ruling party. Increasing educational requirements in politicians may lead to a more responsive government. Furthermore, reducing uncertainty on popular choice, particularly in salient issues, through more active public participation can push for the implementation of policies that benefit the public.

The rest of the paper covers the model in section 2, politician strategies in section 3, the analysis of outcomes for both salient and non-salient issues in section 4, and concluding remarks in section 5.

The Model

Consider a homogenous electorate. The state of nature, $\omega \in \Omega = \{0,1\}$, represents the popular decision, which is perceived to be optimal by the electorate. Both states are equally likely.

Two incumbent politicians $i \in \{1,2\}$ decide on a policy. The electorate knows the state of nature, but the politicians do not. Instead, politician i receives a signal $\theta \in \{0,1\}$ on the state of nature, with quality q. The quality of the signal, $q \in [1/2,1]$, represents the decision-making ability of the politician and can be characterized as follows.

$$\mathrm{P}\,(\theta_i = \omega) = q$$

Bad decision makers have signal qualities close to $1/2$ — a signal of $q = 1/2$ has the accuracy of a random guess. Politicians have the same decision-making abilities and are both aware of the quality of the signals received.

Politicians decide on an action, $a_i \in A_i = \{0,1\}$ simultaneously. A policy is implemented when both politicians choose the same action. Politicians enjoy their popularity among the electorate. The popularity of the incumbents depends on how their actions align with the popular choice. The popularity payoff is given by,

$$\pi_{Pi} = \begin{cases} 1 & \text{if } a_i = \omega \text{ and } a_{-i} \neq \omega, \\ T & \text{if } a_i = \omega \text{ and } a_{-i} = \omega, \\ B & \text{if } a_i \neq \omega \text{ and } a_{-i} \neq \omega, \\ 0 & \text{if } a_i \neq \omega \text{ and } a_{-i} = \omega \end{cases} \tag{1}$$

where, $1 \geq T \geq B \geq 0$.

Incumbent performance is judged in relative terms, with the electorate using the opposing politician's performance as a benchmark. In particular, the politician obtains the highest payoff 1 when they choose the popular decision, and the opposing politician does not. The electorate perceives the politician with the correct decision as the effective agent. In contrast, the politician does not get a payoff when they make the wrong decision when the opposing party chooses

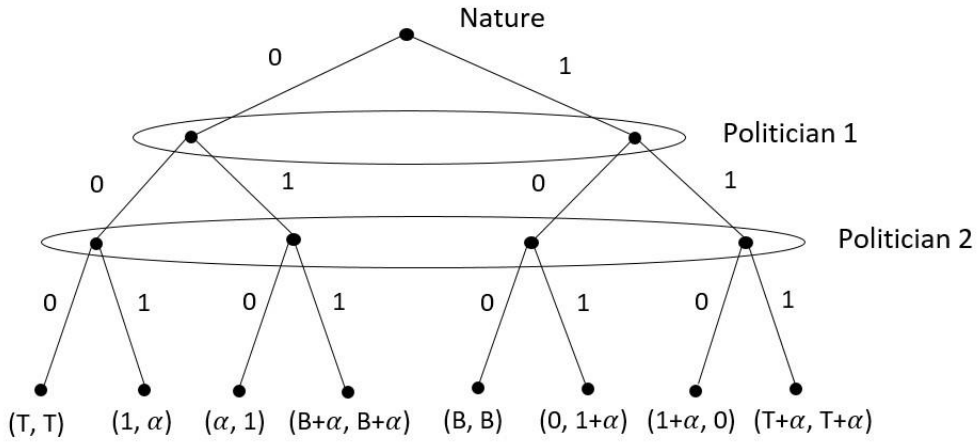


Figure 1
Extensive Form Game

the popular decision. When the popular choice is implemented, the politicians both receive a popularity payoff *T*, less than or equal to what they would have received if the electorate identified them as the sole effective agent. The payoff for implementing a policy that is not the popular choice provides both politicians with utility $B \geq 0$. As both politicians perform poorly, the bad performance is downplayed, and the electorate may provide politicians a payoff for implementing a policy, albeit the incorrect one. This, however, works only in non-salient issues. For salient issues, the electorate only cares about the popular choice ($B = 0$).

Aside from popularity-related payoffs, a politician also receives payoff α if they make a private decision—the decision that coincides with the state where her private agenda lies. The private choice is fixed at $\omega = 1$ for both politicians and is made without loss of generality. I define the agenda payoff as:

$$\pi_A = \begin{cases} \alpha & \text{if } a_i = 1, \\ 0 & \text{if } a_i = 0, \end{cases} \tag{2}$$

where, $\alpha \geq 0$.

The extensive game is illustrated in Figure 1.

Putting the popularity and private benefit payoffs together, the utility of a politician *i* is:

$$u_i(\omega,\, a_i, a_{-i}) = \begin{cases} 1+\alpha & if\ a_i = \omega,\ \ a_{-i} \neq \omega \ \text{ and } \ \omega = 1, \\ 1 & if\ a_i = \omega,\ \ a_{-i} \neq \omega \ \text{ and } \ \omega = 0, \\ T+\alpha & if\ a_i = \omega,\ \ a_{-i} = \omega \ \text{ and } \ \omega = 1, \\ T & if\ a_i = \omega,\ \ a_{-i} = \omega \ \text{ and } \ \omega = 0, \\ B+\alpha & if\ a_i \neq \omega,\ \ a_{-i} \neq \omega \ \text{ and } \ \omega = 0 \\ B & if\ a_i \neq \omega,\ \ a_{-i} \neq \omega \ \text{ and } \ \omega = 1 \\ \alpha & if\ a_i \neq \omega,\ \ a_{-i} = \omega \ \text{ and } \ \omega = 0 \\ 0 & if\ a_i \neq \omega,\ \ a_{-i} = \omega \ \text{ and } \ \omega = 1 \end{cases} \tag{3}$$

The expected utility of politician *i* is computed as follows:

$$EU_i(\sigma_i, \sigma_{-i}) = \sum_{\omega \in \Omega} \frac{1}{2} [P(a_i = \omega)(T\,P(a_{-i} = \omega) + P(a_{-i} \neq \omega)) + B\,P(a_i \neq \omega)P(a_{-i} \neq \omega) + \alpha P(a_i = 1)] \quad (4)$$

A more detailed explanation of the derivation of the expected utility values is shown in Appendix A.

Strategies

$$a_i = 1, \forall\, \theta_i.$$

The politicians can choose one of four strategies, $\sigma_i \in \Sigma = \{H, D, Z, C\}$, explained below:

Honest (H): Politician *i* employs the strategy *Honest* if they follow their signal, $a_i = \theta_i, \forall\, \theta_i$.

Dishonest (D): Politician *i* is *Dishonest* if they always choose the decision in which their private agenda lies, $a_i = 1, \forall\, \theta_i$.

Zero (Z): Politician *i* employs the strategy *Zero* if they always choose $a_i = 0, \forall \theta_i$.

Contrarian (C): Politician *i* is *Contrarian* if they always choose the opposite of what their signal is, that is, $a_i = \theta_i'$, where $\theta_i' \neq \theta_i, \forall\, \theta_i$.

The four strategies provide an exhaustive list of strategies available to politician *i*.

Strategy (*H*) leads politicians to always choose what they believe is the popular decision. The politician acts fully as a delegate. As the model does not provide expert information, the politician is perceived to be honest in their pursuit of the policy that is best for the public. The strategy pays off when the politician has good decision-making abilities (i.e., the quality of the signal q is high enough). Note that the popular decision can also be the decision with the private benefit with a probability of $1/2$. Being honest is also an attractive option as it does not exclude the politician from the private benefit. An honest politician places a lot of stock in their popularity. Career politicians are most likely to consistently subscribe to the strategy (*H*).

Under (*D*), a politician always chooses the private benefit option. The politician acts without regard for public opinion and tries to maximize out-of-office compensation. Politicians who always choose to be dishonest can be viewed in parallel with final term office holders, prioritizing popularity-related payoffs less than office-seeking politicians. Although the dishonest politician chooses the decision with the private benefit, this does not preclude them from reaping popularity payoffs as the decision with the private benefit can be the popular decision with a probability of $1/2$.

A politician who chooses (*Z*) always chooses the decision without the private benefit. Similar to strategy (*D*), a politician disregards public opinion. The probability that the choice of the politician is the popular decision is always $1/2$. A politician who always chooses the decision without the private benefit can be viewed as one with a very strong policy preference.

Under (*C*), a politician always chooses differently from the signal θ_i. It is unlikely to observe a politician following this strategy, but I have included the strategy to provide an exhaustive list of all possible strategies. I show in Appendix C that strategy (*C*) is strictly dominated by strategy (*H*).

Lemma 1. The strategy Contrarian (C) is strictly dominated by Honest (H)

The (*C*) strategy, choosing the action opposite the signal received, is a strictly dominated strategy for all potential opponent strategies. Under strategy (*C*), the probability that the action chosen is the state is $1 - q$. Recall that the quality of signal θ, q, ranges from $1/2$ to 1. From this, $1 - q \in [0, 1/2]$. The odds of making the right choice under this strategy, $1 - q$, are very small. Furthermore, the decision where the private benefit lies is not prioritized. A rational politician with poor decision-making abilities (i.e., $q = 1/2$) is indifferent between (*H*) and (*C*) but is assumed to always choose to be honest. At very poor decision-making abilities, rational individuals would more likely prefer to follow the decision where their private benefit lies to maximize their utility. The popularity payoff from (*H*), dependent on the probability of making the right choice, q is always higher than the corresponding payoff under (*C*), while the expected private benefit α/2 is the same for both. As players always prefer strategy (*H*) over (*C*) regardless of opponent strategies, (*C*) is never chosen as the best response, making it a strictly dominated strategy.

After eliminating the strictly dominated strategy *(C)*, only nine strategy profiles remain. A strategy profile (σ_i , σ_{-i}) is denoted by the strategies of politicians 1 and 2 side by side (e.g., (*H, H*) = *HH*).

Policies are only implemented when both politicians choose the same strategy. Only three strategy profiles yield policy outcomes.

The remaining profiles retain the status quo.

Analysis

We use the following definitions of best responses and Nash equilibrium in this paper.

Definition: *Best Response*

$$BR_i(\sigma_{-i}) = \sigma_i \in \Sigma : EU_1(\sigma_i, \sigma_{-i}) \geq EU_1(\sigma_i', \sigma_{-i}) \text{ for all } \sigma_i' \in \Sigma$$

Definition: *Nash Equilibrium*

$\sigma^* = (\sigma_1^*, \sigma_2^*) \in P$ is a Nash Equilibrium if $\sigma_i^* \in BR_i(\sigma_{-i}^*)$ for every $i \in N$

The analysis performed looks at two possible cases: one for non-salient issues ($T = B$) and another for salient issues ($B = 0$). Both outcomes allow for the focus to be primarily on whether policies are implemented given the trade-offs politicians face with their private benefit. The best responses and equilibrium outcomes are explored for each case, and the impact of each parameter is then performed. All the derivations can be found in full in the appendix. Only the final results are shown in subsequent analysis.

Let $BR_i(\sigma_{-i}) \subset \Sigma$ be the set of player i's best response bids against $\sigma_{-i} \in \Sigma$. I begin with the determination of the best responses for the three remaining strategies, honest (H), dishonest (D), and zero (Z) for non-salient issues.

Non-Salient Issues

When the issue is non-salient ($T = B$), the electorate is indifferent to the policy implemented. The issue is not of high relevance to the electorate but one where there is consensus on the correct decision. A good example of this is the 2016 law unanimously passed in France to force supermarkets to donate unsold food to charities and food banks and ban its disposal (Chisafis, 2016). The decision here is fairly clear cut: there are clear gains in supporting the law. Note, however, that as the issue is non-salient, and the law or its variations do not directly affect the public, a policymaker is still found to be effective if the other politician acts in a similar manner. The absence of distinction between electorate responses under the implementation of popular and non-popular policies can be observed in issues of little public relevance. The policy implementation payoffs, in this case, are equal, $B = T$. The electorate rewards the politicians a certain value T if a policy is implemented. The same value is awarded regardless if the enacted policy matches the popular decision. If the politicians choose opposite actions, only then does choosing the popular decision provides a larger benefit.

Best Responses for Non-Salient Issues ($B = T$)

When $\sigma_{-i} = H$

$$BR_i(H) = \begin{cases} H & if\ T \geq \frac{1-q}{1-2q} + \frac{\alpha}{(1-2q)^2} \\ D & otherwise. \end{cases}$$

Recall from Equation (1), the payoff of implementing the popular policy ($a_i = a_{-i} = \omega$) is given by T, and the payoff for implementing the wrong policy ($a_i = a_{-i} \neq \omega$) is given by B. As the issue is non-salient, the issues have no direct impact on the electorate. As long as a policy is implemented, a politician is perceived to be as effective as their competitors, with both politicians receiving T, as $B = T$. As T increases, the appeal of matching the opponent's decision increases. Looking at the threshold value for best response (H) when $\sigma_{-i} = H$, the constraint $(1-q)/(1-2q)+\alpha/(1-2q)^2$ relaxes when $q < 0.5 + 2\alpha$. Recall that $q \in [1/2, 1]$. When $\alpha \geq 0.25$, q always satisfies the constraint, making the constraint relax as α increases. As q increases, the area where (H) is the best response also increases. Improving the decision-making ability of the politician leads to higher payoffs for strategy (H), making it a more attractive option. A politician with very poor decision-making ability (i.e., $q = 1/2$) never chooses to be honest. As the accuracy of strategy (H) is very low, the payoff from the private decision, α, becomes more attractive, leading the politician to choose to be dishonest (D).

When $\sigma_{-i} = D$

$$BR_i(D) = \begin{cases} D & if\ T \geq q - \alpha, \\ H & if\ 1 - q - \alpha \leq T \leq q - \alpha, \\ Z & otherwise \end{cases}$$

Matching strategy (D) with dishonesty is the best response only when the payoff from policy

implementation T is sufficiently high. As the decision-making ability q improves, the expected utility of choosing (H) increases, making dishonesty less attractive. Strategy (H) is only the best response when the incentive of matching the opponent's decision is not too high. However, if the T is sufficiently low given q and α, the politician capitalizes on the fact that each state is equally likely to be the popular decision and always chooses the opposite decision and follows strategy (Z). Note, however, that when the politician chooses strategy (Z), the private benefit is forgone. As the decision-making ability of the politician q improves, choosing the opposing decision (Z) becomes less attractive as the best response, and politicians move to other options that allow for the private benefit payoffs to be reaped.

When $\sigma_{-i} = Z$

$$BR_i(Z) = \begin{cases} Z & if\ T \geq q + \alpha, \\ H & if\ 1 - q + \alpha \leq T \leq 0.5 + \alpha, \\ D & otherwise. \end{cases}$$

As observed previously, at a sufficiently high level of policy implementation payoff T, matching the opponent's decision becomes the best response. For very low levels of T, and subsequently at low levels of q, being dishonest is the best response. When the payoffs from policy implementation are low, politicians with low levels of decision-making ability are better off taking opposing positions to increase the odds of solely choosing the popular decision and securing the highest level of popularity payoff.

From the best responses above, I obtain the Bayesian Nash equilibrium, stated in Proposition 1.

Proposition 1. For non-salient issues ($B = T$)

1. If $T \geq \frac{1-q}{1-2q} + \frac{\alpha}{(1-2q)^2}$, there exists an equilibrium HI
2. If $T \geq q - \alpha$, there exists an equilibrium DD,
3. If $T \geq q + \alpha$, there exists an equilibrium ZZ,
4. If $T < 1 - q - \alpha$, there exists two possible equilibria, ZD or DZ,
5. If $T < \frac{1-q}{1-2q} + \frac{\alpha}{(1-2q)^2}$ and $1 - q - \alpha < T < q - \alpha$, there exists two possible equilibria HD or DH.

Whether or not policies are passed depends on the decision-making abilities of the politicians and the size of their private benefit. Amongst all equilibria conditions, only equilibrium with at least one politician choosing strategy (D) has constraints that relax as α increases (See point 2 of Proposition 1). Unsurprisingly, an increase in the size of the private benefit steers politicians from following the popular decision and decreases the likelihood for the popular policy to be passed. The higher the private benefit, the propensity for dishonesty increases.

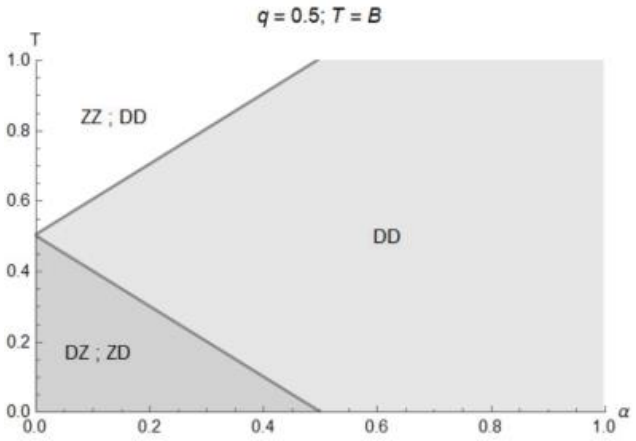
From point 1 of Proposition 1, it is evident that as q increases, the higher the accuracy of the signal, the higher the payoffs for strategy (H), making it more attractive for politicians. However, the conditions that underscore honesty as a stable equilibrium appear to be more complex than the conditions for dishonesty. The results state that the clearer the public opinion is on an issue, the more likely it is for politicians to take note of popular opinion in the policy formation process.

In general, increasing policy implementation payoff T increases the chances of a policy being passed. However, as the electorate is assumed to be indifferent between policies ($B = T$), the popular policy is not always implemented. I find from point 3 of Proposition 1 that at extremely high rewards on policy implementation and a sufficiently small private benefit, the politicians both choose strategy (Z), implementing a policy that is neither popular nor provides a private benefit. Despite the low private benefit payoff, the high policy implementation payoff provides both politicians to shirk and coordinate to implement a policy without regard to their signal q. Politicians may cease to follow what the electorate wants as they are rewarded for their decisions despite the implementation of subpar policies. I observe that politicians with lower decision-making abilities are more susceptible to this behavior than better decision-makers.

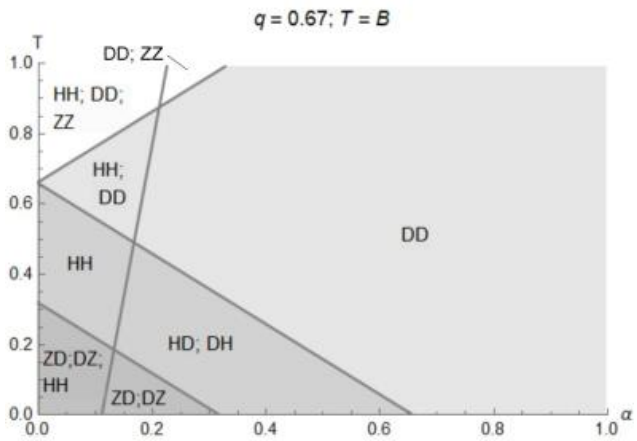
Furthermore, when politicians with poor decision-making abilities are faced with low policy implementation payoffs and a small private benefit, the politicians choose to implement a policy that is not in line with the private benefit. Both politicians can decide to ensure that they both get the payoff for policy implementation T, when the alternative offered by the private sector is not sufficiently high. As their decision-making ability is poor, the decision to employ strategy (H) is risky as politicians may end up with no popularity-related payoffs.

For non-salient issues, a policy is always implemented if the policy implementation payoff, T, is greater than $1/2$. It is useful to note that as the payoffs for implementing a popular and non-popular policy are the same (i.e., T=B), a higher level of coordination between the lobbyists is expected. Looking at all equilibrium conditions in Proposition 1, an increase in the policy implementation payoff makes all pooling equilibria more likely. One would assume that with sufficiently low policy implementation rewards, politicians would prioritize their private benefits regardless of their amount—leading to the implementation of suboptimal policy decisions. However, I observe in this model that no policy is implemented when both the policy and private benefit incentives are very low. As politicians do not have much to gain from jointly choosing the popular choice, one chooses the option with the private agenda, whereas the other maximizes expected utility by capitalizing on the opponent's dishonesty. By choosing the remaining option (i.e., $a_i = 0$), the opponent increases the odds of being identified as the sole effective agent. Similarly at low policy rewards, good enough decision-makers with moderate private benefits find themselves diverging in strategies, with one being dishonest and securing the private agenda values and the other capitalizing on the other's dishonesty by following what they believe to be the popular decision.

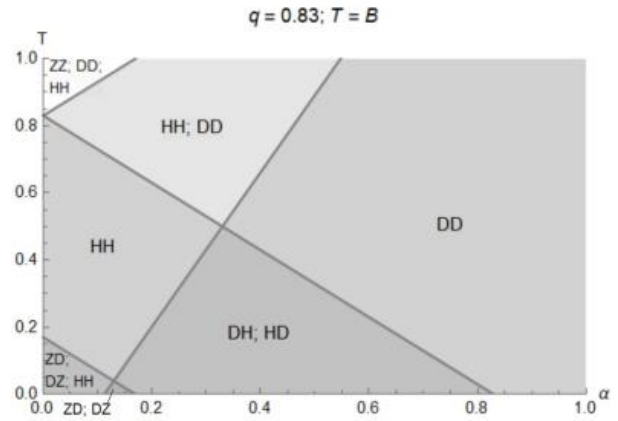
In order to better illustrate results, the equilibria for non-salient issues are shown in Figure 2.



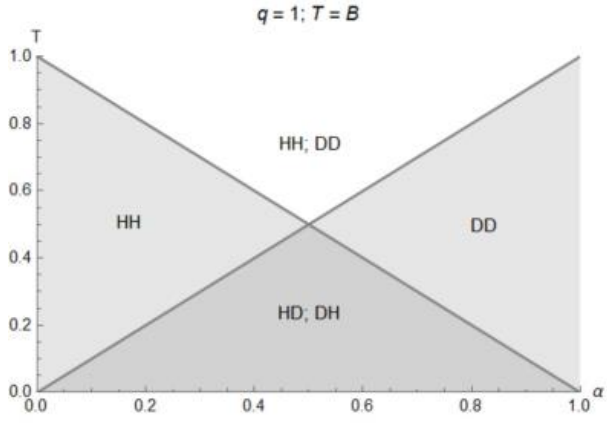
(a) At q = 0.5



(b) At q = 0.67



(c) At q = 0.83



(d) At q = 1

Figure 2
Illustration of Equilibria for Non-Salient Issues

Salient Issues

When the issue is salient, the electorate rewards politicians for implementing a policy only when it is optimal. Salient issues are often on a larger scale, such as taxation and health care, and affect the population directly. For example, the Philippines' Reproductive Health Law, with its direct impact on the electorate, the nationwide implementation, and the amount of public awareness on the issue, is a salient issue. The implementation of a non-popular policy is equivalent to choosing the wrong action when the opposing politician has chosen the popular decision. The electorate's support is less flexible compared to non-salient issues. The implementation of an optimal policy yields politicians a payoff T each; otherwise, no payoff is received, $B = 0$.

Best Responses for Salient Issues ($B = 0$)

When $\sigma_{-i} = H$

$$BR_i(H) = \begin{cases} H & if\ \ T \geq \frac{\alpha+2q^2-3q+1}{2q^2-q} \\ D & otherwise. \end{cases}$$

Politicians only obtain payoffs when the popular decision matches their action, $a_i = \omega$. As T increases, strategy (H) becomes more attractive. Furthermore, as the decision-making ability increases, the constraint $(\alpha + 2q^2 - 3q + 1)/(2q^2 - q)$ relaxes. Politicians with better decision-making abilities are more likely to respond to honesty with honesty. When decision-making ability is poor, the politician is better off taking strategy (D), securing private benefit and a 50% chance of obtaining the maximum popularity payoff 1.

When $\sigma_{-i} = D$

$$BR_i(D) = \begin{cases} D & if\ \ T \geq \frac{q-\alpha}{1-q}, \\ H & if\ \ \frac{1-q-\alpha}{q} \leq T \leq \frac{q-\alpha}{1-q} \\ Z & otherwise \end{cases}$$

Similar to the case where the issue is non-salient ($T = B$), matching strategy (D) with dishonest as the best response only occurs when the payoff from implementing the popular policy, T is sufficiently high, despite no rewards for the implementation of the wrong policy, $B = 0$. However, for salient issues, the minimum policy implementation for dishonesty to be the best response is much higher. Comparing the two constraints, it can be observed that the constraint for (D) to best respond to dishonesty under salient issues is $1/(1 - q)$ times the constraint under non-salient issues. Improved decision-making ability q makes strategy (H) more attractive. As before, if both the popular policy implementation payoff T and private benefit α are low enough (i.e., $\alpha \leq 1-q$), and decision-making ability is poor, the politician best responds by choosing the opposite decision with strategy (Z) and secures the maximum popularity payoff of 1 with a probability of $1/2$.

When $\sigma_{-i} = Z$

$$BR_i(Z) = \begin{cases} H & if\ \ T \geq 1 + \alpha, \\ D & otherwise \end{cases}$$

The popular policy implementation payoff T needs to be sufficiently high for strategy (Z) to be the best response. However, as politicians are only rewarded when the correct decision is chosen or implemented as policy, it does not make sense for the politicians to coordinate and implement a policy without regard to the signal and no private benefit. The politician is better off being honest when the payoff for implementing the popular policy is sufficiently high. At very low levels of policy implementation payoffs, politicians with poor decision-making skills obtain more by choosing to be dishonest and taking the private benefit.

Proposition 2. For salient issues ($B = 0$),

1. If $T \geq \frac{\alpha+2q^2-3q+1}{2q^2-q}$, there exists an equilibrium HH,
2. If $T \geq \frac{q-\alpha}{1-q}$, there exists an equilibrium DD,
3. If $T < \frac{1-q-\alpha}{q}$, there exists two equilibria ZD or DZ,
4. If $T < \frac{\alpha+2q^2-3q+1}{2q^2-q}$ and $\frac{1-q-\alpha}{q} \leq T \leq \frac{q-\alpha}{1-q}$, there exists two equilibria HD or DH.

When issues are salient, the area where policy implementation is an equilibrium is smaller. The minimum payoffs for the implementation of the popular policy T required to observe coordination among politicians for all three strategies (honest, dishonest, and zero) are higher compared to those under non-salient issues. As policy implementation

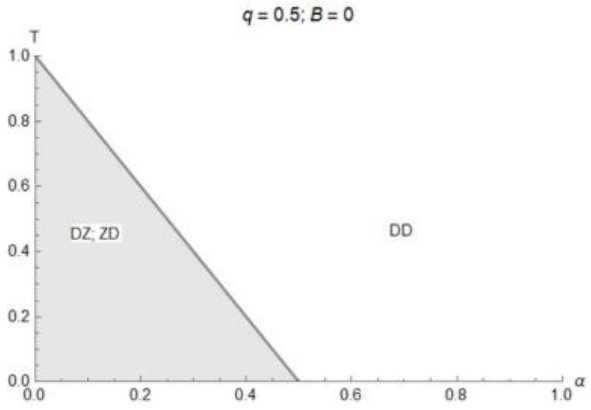
only pays when the popular choice is implemented in salient issues, the higher policy payoff is necessary to compensate for the lower probability of securing popularity through policy. The certainty of a policy being implemented at sufficiently high levels of *T* now disappears as there is no gain to be made in passing a suboptimal policy. As expected, increasing the popular policy implementation payoff increases the chance of the popular policy to be implemented. Increased awareness and scrutiny from the electorate on politicians' actions influence the type of policies implemented.

As only optimal choices are rewarded when issues are salient, pooling at *ZZ*, where both politicians settle on the action without the private benefit, provides a very low payoff. Action *Z* only comes into equilibrium when the opposing politician chooses to be dishonest with both policy implementation payoffs and the private benefit sufficiently low. Politicians are better off trying to appear as the effective agent under this scenario and chooses the opposite of their opponent's action. When the decision-making ability of politicians improves, this equilibrium becomes less likely, and politicians gravitate toward strategy (*H*).

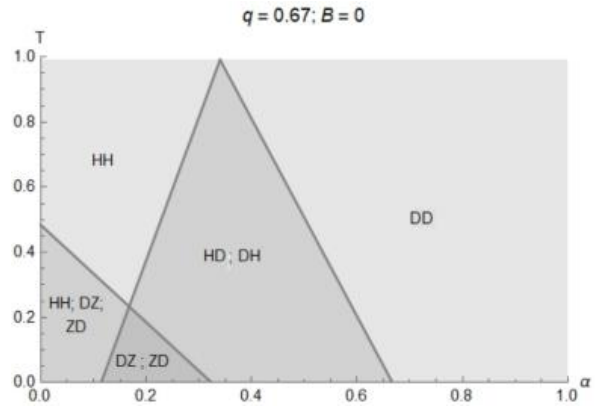
Proposition 2 is illustrated in Figure 3.

Variations in Popularity-Related Payoffs

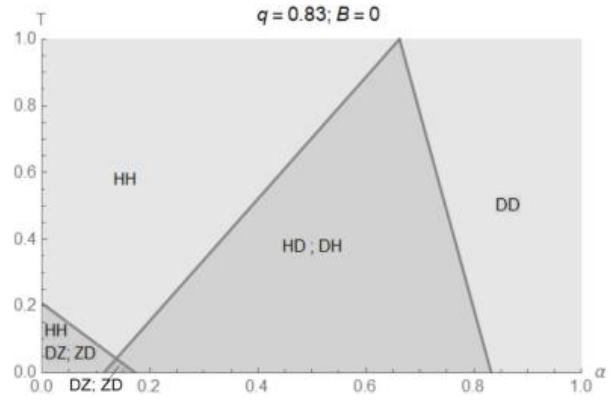
Although an increase in popularity-related payoffs increases the likelihood of honesty and, subsequently, the passing of popular policies, when there is no difference in the payoffs across different policy types, the room for politicians to ignore the wishes of the electorate also expands. When issues are non-salient, politicians are faced with different options to accumulate benefits, and choosing to follow their signal on the popular choice could be risky. It is not unlikely



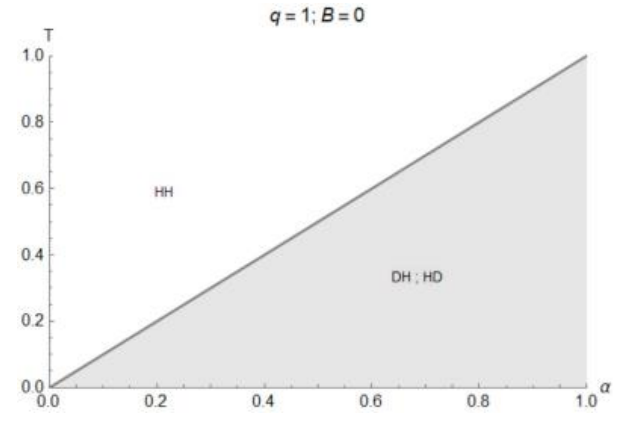
(a) At q = 0.5



(b) At q = 0.67



(c) At q = 0.83



(d) At q =1

Figure 3
Illustration of Equilibria for Salient Issues

to see results that veer away from the popular law being passed. This corroborates existing empirical results that the salience of the issue has a direct impact on the influence of public opinion in policy (Wattenberg, 2004; Myatt, 2017). A study by Cleary (2007) in 2,400 municipalities in Mexico from 1989 to 2000 also found that the quality and responsiveness of the municipal government depended more on the degree of citizen engagement rather than a threat of non-reelection.

Considering the equilibrium *ZZ*, bad decision-makers implement a policy without any private agenda to secure very high popularity payoffs when the private benefits are very low. A possible explanation for this is put forward by Burstein (2006) in his study of the effect of public opinion on random proposals within the U.S. House of Congress. Burstein (2006) found that the impact of public opinion is considerably less than previous statistical studies on the subject, summarized by (Page, 2002), but posited that this might be due to the public not having strong opinions, leaving room for organized interests to win.

One way to induce honesty is to distinguish between the implementation of policies that are popular and those that are not. Recall that for salient issues, $B = 0$. This represents the extreme case where there are no payoffs in the policy unless it coincides with the popular choice. The multiplicity of equilibria observed when issues are non-salient disappears when the condition that only the implementation of popular policy is implemented.

Variations in Private Benefit

Regardless of issue salience, an increase in private agenda-related payoffs unambiguously increases the politician's propensity to be dishonest. As private gains increase relative to the rewards one stands to gain from passing a law, a rational individual tries harder to secure the private benefit. The result that an increase in the private gains available induces dishonesty amongst elected officials is not unexpected. Despite this, the increase in the likelihood of both politicians choosing dishonesty is tempered by higher levels of decision-making ability. Although the maximum value obtainable in the popularity-related payoffs is capped at one, values of $\alpha > 1$ are allowed. At $\alpha = 1$, the politician immediately chooses to be dishonest regardless of T and is carried over for all private benefit values above that of the popularity payoffs.

Variations in Decision-Making Ability

An increase in decision-making ability reduces the minimum required policy implementation payoff T for honesty as an equilibrium strategy for both politicians, whereas increasing thresholds for dishonest and zero strategies. Decision-making ability is defined by the quality of the signal received. The quality of the signal received can encompass the innate abilities of the politician and the resources the politician has to gather information on public opinion. Unlike changes in the rewards of policy implementation, the increase in decision-making ability singularly pushes for the implementation of popular choices. Better decision-makers have more incentive to be honest as there is less risk in getting the popular choice correctly. Empirical results in India show that education increases the chances of selection to public office and makes politicians less likely to be opportunistic in office (Besley et al., 2005). This also supports the findings by Besley et al. (2011), where growth is higher when leaders are highly educated. The effect of decision-making ability on the selection of honest equilibrium strategies is more pronounced when the issue is more salient. As the electorate does not reward the suboptimal policies, politicians are more careful with their actions and avoid passing policies without the private benefit when no information on the popular decision is available.

Analysis of Voter Welfare

The implementation of the popular policy improves voter welfare. The popular choice embodies the voter's choice. Recall that in our model, the electorate knows what is best for them. The voter welfare is measured by the probability that a popular policy is implemented under each possible pair of actions in equilibrium.

We summarize these probabilities in Table 1.

When the decision-making ability of the incumbents is poor, the electorate is worse off when both politicians are honest than dishonest. However, once the decision-making ability of the politicians becomes sufficiently good ($q \geq 0.71$), the electorate's welfare is always the highest when both politicians are honest. The welfare of the voters for the implementation of policy without regard to the popular decision is $1/2$, which is simply the probability of the popular decision occurring. It can be observed that for all possible equilibrium pairs,

Table 1. *Probability of Popular Policy Implementation in Equilibrium*

	Voter Welfare
Equilibrium Actions	% of Popular Policy is Implemented
HH	q^2
DD	
ZZ	$\frac{1}{2}$
HD	$\frac{1}{2}$
ZD	$\frac{1}{2}q$
	0

pooling equilibria always provide higher welfare to the voter, as $q \in [1/2,1]$, and voters are worse off when the politicians do not coordinate.

Conclusion

The paper explores a setting wherein two competing politicians decide on a policy. The decision requires the politician to consider the trade-offs between following the popular choice and the private agenda option. Politicians receive a signal on the uncertain popular choice. I introduced a model of relative popularity where the performance of the politician is benchmarked by the performance of her opponent. Depending on the policy rewards, the private benefit, and the decision-making ability of the politicians, a coordination or anti-coordination game is played.

Through a model of relative popularity, I found how a politician's private interests and public opinion affect policy outcomes. Higher payoffs from the private sector increase the propensity of politicians to become dishonest. Increasing rewards on popular policy implementation increases the propensity of politicians to be honest regardless of issue salience. However, without distinction in policy implementation rewards, politicians find an incentive to collude and decide on one decision without regard to the popular choice. Introducing a distinction between optimal and suboptimal policies helps delineate the strategies better and implement optimal policy choices. Furthermore, an increased requirement in the decision-making of politicians pushes toward the implementation of popular policies. It is possible to curb dishonest behavior and induce honest behavior by increasing public regard for successful law implementation and a stronger perception of implementing the choices of a well-informed electorate.

I aim to provide another perspective on a politician's behavior. By considering relative popularity, the model explores how politicians measure their responses given the actions of their opponents. The impact of reelection, and the introduction of a distinction between socially optimal and popular choices will be interesting to explore as future extensions to the model. The model can also be extended to multi-issue platforms with varying degrees of salience to find out when and where politicians compromise under a wide selection of issues that they are accountable for.

Note

I take this into account in the modeling process: the electorate only considers how the actions of the politician align with the popular choice and politicians are not punished for taking the private benefit.

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Appendix

A. Expected Utility Values when B = T

The expected utility value of politicians for non-critical issues, $B = T$, can be computed as follows:

$$EU_i(\sigma_i, \sigma_{-i}) = \sum_{\omega \in \Omega} [\frac{1}{2}(T\, P(a_i = \omega)P(a_{-i} = \omega) + P(a_i = \omega)P(a_{-i} \neq \omega) + B\, P(a_i \neq \omega)P(a_{-i} \neq \omega)] + \alpha P(a_i = 1)$$

Recall that payoffs do not differ according to the policy implemented, $B = T$, and that each state is equally likely, $P(\omega = 0) = P(\omega = 1) = \frac{1}{2}$.

Expected Utility of Player 1 when $\sigma_i = \sigma_{-i} = H$

$$\begin{aligned} EU_1(H, H) &= P[\omega = 0]X + P[\omega = 1]Y \\ &= T + q(1 - 2T) - q^2(1 - 2T) + 0.5\alpha \end{aligned}$$

where,

$$X = \underbrace{\underbrace{T}_{\pi_{P_i}} \underbrace{q}_{P(a_i=\omega)} \underbrace{q}_{P(a_{-i}=\omega|\omega=0)}}_{a_i=a_{-i}=\omega} + \underbrace{\underbrace{1}_{\pi_{P_i}} \underbrace{q}_{P(a_i=\omega)} \underbrace{(1-q)}_{P(a_{-i}\neq\omega|\omega=0)}}_{a_i=\omega\neq a_{-i}} + \underbrace{\underbrace{T}_{\pi_{P_i}} \underbrace{(1-q)}_{P(a_i\neq\omega)} \underbrace{(1-q)}_{P(a_{-i}\neq\omega|\omega=0)}}_{a_i=a_{-i}\neq\omega} +$$

$$\underbrace{\alpha}_{\pi_{R_i}} \underbrace{(1-q)}_{P(a_i=1)}$$

$$Y = \underbrace{\underbrace{T}_{\pi_{P_i}} \underbrace{q}_{P(a_i=\omega)} \underbrace{q}_{P(a_{-i}=\omega|\omega=1)}}_{a_i=a_{-i}=\omega} + \underbrace{\underbrace{1}_{\pi_{P_i}} \underbrace{q}_{P(a_i=\omega)} \underbrace{(1-q)}_{P(a_{-i}\neq\omega|\omega=1)}}_{a_i=\omega\neq a_{-i}} + \underbrace{\underbrace{T}_{\pi_{P_i}} \underbrace{(1-q)}_{P(a_i\neq\omega)} \underbrace{(1-q)}_{P(a_{-i}\neq\omega|\omega=1)}}_{a_i=a_{-i}\neq\omega} +$$

$$\underbrace{\alpha}_{\pi_{R_i}} \underbrace{q}_{P(a_i=1)}$$

The remaining expected utilities are computed in a similar fashion:

$$EU_1(H,D) = 0.5q + 0.5T + 0.5\alpha$$
$$EU_1(H,Z) = 0.5q + 0.5T + 0.5\alpha$$
$$EU_1(H,C) = q^2(1 - 2T) + 2qT + 0.5\alpha$$

$$EU_1(D,H) = 0.5 - 0.5q + 0.5T + \alpha$$
$$EU_1(D,D) = T + \alpha$$
$$EU_1(D,Z) = 0.5 + \alpha$$
$$EU_1(D,C) = 0.5q + 0.5T + \alpha$$

$$EU_1(Z,H) = 0.5 - 0.5q + 0.5T$$
$$EU_1(Z,D) = 0.5$$
$$EU_1(Z,Z) = T$$
$$EU_1(Z,C) = 0.5q + 0.5T$$

$$EU_1(C,H) = 1 + q^2(1 - 2T) + 2q(T - 1) + 0.5\alpha$$
$$EU_1(C,D) = 0.5(1 - q) + 0.5T + 0.5\alpha$$
$$EU_1(C,Z) = 0.5(1 - q) + 0.5T + 0.5\alpha$$
$$EU_1(C,C) = q^2(2T - 1) - q(2T - 1) + T + 0.5\alpha$$

As the players are symmetric, the corresponding strategy combinations yield the same expected utility values for player 2 (e.g., $EU_1(H,D) = EU_2(D,H)$).

B. Expected Utility Values when B = 0

The expected utility value of politicians when the issue is critical $B = 0$ is given below:

$$EU_i(\sigma_i, \sigma_{-i}) = \sum_{\omega \in \Omega} \frac{1}{2}(T\,P(a_i = \omega)P(a_{-i} = \omega) + P(a_i = \omega)P(a_{-i} \neq \omega) + \alpha P(a_i = 1)$$

The expected utility functions are computed similarly to the previous case and are shown as follows:

$$EU_1(H,H) = q^2(T-1) + q + 0.5\alpha$$
$$EU_1(H,D) = 0.5q(T+1) + 0.5\alpha$$
$$EU_1(H,Z) = 0.5q(T+1) + 0.5\alpha$$
$$EU_1(H,C) = q(q + T - qT) + 0.5\alpha$$

$$EU_1(D,H) = 0.5q(T-1) + 0.5 + \alpha$$
$$EU_1(D,D) = 0.5T + \alpha$$
$$EU_1(D,Z) = 0.5 + \alpha$$
$$EU_1(D,C) = 0.5(q + T - qT) + \alpha$$

$$EU_1(Z,H) = 0.5q(T-1) + 0.5$$
$$EU_1(Z,D) = 0.5$$
$$EU_1(Z,Z) = 0.5T$$
$$EU_1(Z,C) = 0.5((1-q)T + q)$$

$$EU_1(C,H) = q^2(1-T) + q(T-2) + 1 + 0.5\alpha$$
$$EU_1(C,D) = 0.5T + q(-0.5T - 0.5) + 0.5 + 0.5\alpha$$
$$EU_1(C,Z) = 0.5T + q(-0.5T - 0.5) + 0.5 + 0.5\alpha$$
$$EU_1(C,C) = q(q(T-1) - T + 1) + (1-q)T + 0.5\alpha$$

As the players are symmetric, the corresponding strategy combinations yield the same expected utility values for player 2.

C. Proof of Lemma 1

Definition. Strictly Dominated Strategies

Player i 's strategy σ_i'' **strictly dominates** her strategy σ_i' if

$EU_i(\sigma_i'', \sigma_{-i}) > EU_i(\sigma_i', \sigma_{-i})$ for every list σ_{-i} of the other players' strategies.

The strategy σ_i' is **strictly dominated**.

Expected Utilities for strategies (*H*) and (*C*) are compared for all possible opponent strategies. Only player one values are used in the proof as the players are symmetric.

Note that at $q = 1/2$ the expected utilities for (*H*) and (*C*) are equal. I assume that the politician *i* always chooses (*H*) in this scenario.

HH vs CH

$$EU_1(H, H) > EU_1(C, H)$$

$$T + q(1 - 2T) - q^2(1 - 2T) + 0.5\alpha > 1 + q^2(1 - 2T) + 2q(T - 1) + 0.5\alpha$$

$$T \geq 0.5 + \frac{0.25}{0.5 - q}$$

Recall that $q \in [\frac{1}{2}, 1]$. As q approaches 1, the T threshold, $0.5 + \frac{0.25}{0.5-q}$ becomes less negative. The values of the threshold at $q = \frac{1}{2}$, and $q = 1$ are given below:

$$q = \frac{1}{2}: \qquad lim_{q \to \frac{1}{2}} \quad 0.5 + \frac{0.25}{0.5 - q} = -\infty$$

$$q = 1: \qquad 0.5 + \frac{0.25}{0.5 - 1} = 0$$

The threshold function $0.5 + \frac{0.25}{0.5-q}$ is continuously differentiable in the interval $q \in [\frac{1}{2}, 1]$ and is monotonically increasing. As the maximum threshold value is 0 at $q = 1$, it follows for all permissible values of q, I find that T satisfies the threshold condition as $0 \leq T \leq 1$. Therefore, $EU_1(H,H) > EU_1(C,H)$.

HD versus CD

$$EU_1(H, D) > EU_1(C, D)$$

$$0.5q + 0.5T + 0.5\alpha > 0.5(1 - q) + 0.5T + 0.5\alpha$$

$$q > 1 - q$$

As $q > 1 - q$ when $q \neq 1/2$, and politician *i* always chooses (*H*) when $q = 1/2$, $EU_1(H, D) \geq EU_1(C,D)$.

HZ vs CZ

$$EU_1(H, Z) > EU_1(C, Z)$$

$$0.5q + 0.5T + 0.5\alpha > 0.5(1 - q) + 0.5T + 0.5\alpha$$

$$q > 1 - q$$

As $q > 1 - q$ when $q \neq 1/2$, and politician *i* always chooses (*H*) when $q = 1/2$, $EU_1(H, Z \geq EU_1(C, Z)$.

HC versus CC

$$EU_1(H,C) > EU_1(C,C)$$
$$q^2(1-2T) + 2qT + 0.5\alpha > q^2(2T-1) - q(2T-1) + T + 0.5\alpha$$
$$T < \frac{q}{2q-1}$$

Similar to *HH vs CH*, I obtain the threshold values at $q = \frac{1}{2}$ and $q = 1$:

$$q = \frac{1}{2}: \qquad lim_{q \to \frac{1}{2}} \quad \frac{q}{2q-1} = \infty$$
$$q = 1: \qquad \frac{q}{2q-1} = 1$$

The threshold function $\frac{q}{2q-1}$ is continuously differentiable in the interval $q \in [\frac{1}{2}, 1]$ and is monotonically decreasing. As the minimum threshold value is 1 at $q = 1$, it follows for all permissible values of q, I find that T satisfies the threshold condition as $0 \leq T \leq 1$. Therefore, $EU_1(H, C) > EU_1(C, C)$.

I have demonstrated above that strategy (C) is strictly dominated by strategy (H) when $B = T$. For $B = 0$, no payoffs are obtained for choosing the suboptimal choice. As the probability of choosing the popular decision is always higher in (H) than in (C), it follows that all expected utilities under (H) are always greater than those under (C), holding constant. Therefore, strategy (C) is also strictly dominated by strategy (H) when $B = 0$.

D. Derivation of Best Responses when $B = T$

The best responses are obtained for each of the three remaining strategies:
$\Sigma_i = \{H, D, Z\}$. . All calculations shown are representative of the expected utility of any player $i \in \{1, 2\}$.

When $\sigma_{-i} = H$

$$EU_1(H,H) = T + q(1-2T) - q^2(1-2T) + 0.5\alpha$$
$$EU_1(D,H) = 0.5 - 0.5q + 0.5T + \alpha$$
$$EU_1(Z,H) = 0.5 - 0.5q + 0.5T$$

For all possible combinations of T, q, and α, $EU_1(D, H) \geq EU_1(Z, H)$. Looking for T values where $EU_1(H, H) > EU_1(D, H)$,

$$EU_1(H,H) \geq EU_1(D,H)$$
$$T + q(1-2T) - q^2(1-2T) + 0.5\alpha \geq 0.5 - 0.5q + 0.5T + \alpha$$
$$T \geq \frac{1-q}{1-2q} + \frac{\alpha}{(1-2q)^2}$$

The best responses for σ_{-i} are given as follows:

$$BR_i(H) = \begin{cases} H & if\ T \geq \frac{1-q}{1-2q} + \frac{\alpha}{(1-2q)^2} \\ D & otherwise. \end{cases}$$

When σ_{-i} = D

$$EU_1(H,D) = 0.5q + 0.5T + 0.5\alpha$$

$$EU_1(D,D) = T + \alpha$$

$$EU_1(Z,D) = 0.5$$

Three threshold conditions are necessary to determine the set of best responses for σ_{-i} = D

$$EU_1(D,D) \geq EU_1(H,D)$$

$$T + \alpha \geq 0.5q + 0.5T + 0.5\alpha$$

$$0.5T \geq 0.5q - 0.5\alpha$$

$$T \geq q - \alpha$$

$$EU_1(H,D) \geq EU_1(Z,D)$$

$$0.5T \geq 0.5 - 0.5q - 0.5\alpha$$

$$T \geq 1 - q - \alpha$$

$$EU_1(D,D) \geq EU_1(Z,D)$$

$$T + \alpha \geq 0.5$$

$$T \geq 0.5 - \alpha$$

From the conditions above, the best responses for σ_{-i} = D are given as follows:

$$BR_i(D) = \begin{cases} D & if\ T \geq q - \alpha, \\ H & if\ 1 - q - \alpha \leq T \leq q - \alpha, \\ Z & otherwise \end{cases}$$

When σ_{-i} = Z

$$EU_1(H,Z) = 0.5q + 0.5T + 0.5\alpha$$

$$EU_1(D,Z) = 0.5 + \alpha$$

$$EU_1(Z,Z) = T$$

Three threshold conditions are necessary to determine the set of best responses for σ_{-i} = Z

$$EU_1(H,Z) \geq EU_1(D,Z)$$
$$0.5q + 0.5T + 0.5\alpha \geq 0.5 + \alpha$$
$$0.5T \geq 0.5 + 0.5\alpha - 0.5q$$
$$T \geq 1 - q + \alpha$$

$$EU_1(Z,Z) \geq EU_1(D,Z)$$
$$T \geq 0.5 + \alpha$$

$$EU_1(Z,Z) \geq EU_1(H,Z)$$
$$T \geq 0.5q + 0.5T + 0.5\alpha$$
$$0.5T \geq 0.5q + 0.5\alpha$$
$$T \geq q + \alpha$$

From the conditions above, the best responses for $\sigma_{-i} = Z$ are given as follows:

$$BR_i(Z) = \begin{cases} Z & if\ T \geq q + \alpha, \\ H & if\ 1 - q + \alpha \leq T \leq 0.5 + \alpha, \\ D & otherwise. \end{cases}$$

E. Derivation of Best Responses when $B = 0$

As with the best responses for $B = T$, the best responses are obtained for each of the three remaining strategies: $\Sigma_i = \{H, D, Z\}$ when $B = 0$. All calculations shown are representative of the expected utility of any player $i \in \{1, 2\}$.

When $\sigma_{-i} = H$

$$EU_1(H,H) = q^2(T - 1) + q + 0.5\alpha$$
$$EU_1(D,H) = 0.5q(T - 1) + 0.5 + \alpha$$
$$EU_1(Z,H) = 0.5q(T - 1) + 0.5$$

For all possible combinations of T, q, and α, $EU_1(D, H) > EU_1(Z,H)$. Looking for T values where $EU_1(H, H) > EU_1(D,H)$,

$$EU_1(H,H) \geq EU_1(D,H)$$
$$q^2(T-1) + q + 0.5\alpha \geq 0.5q(T-1) + 0.5 + \alpha$$
$$T \geq \frac{\alpha + 2q^2 - 3q + 1}{2q^2 - q}$$

The best responses for $\sigma_{-i} = H$ are given as follows:

$$BR_i(H) = \begin{cases} H & if\ T \geq \frac{\alpha+2q^2-3q+1}{2q^2-q} \\ D & otherwise. \end{cases}$$

When $\sigma_{-i} = D$

$$EU_1(H, D) = 0.5q(T + 1) + 0.5\alpha$$
$$EU_1(D, D) = 0.5T + \alpha$$
$$EU_1(Z, D) = 0.5$$

The T conditions where strategy σ_i provides higher payoffs than σ_i' given $\sigma_{-i} = D$ are as follows:

$$\begin{aligned} EU_1(D, D) &\geq EU_1(H, D) \\ 0.5T + \alpha &\geq 0.5q(T + 1) + \\ T &\geq q(T + 1) - \alpha \\ T(1 - q) &\geq q - \alpha \\ T &\geq \frac{q - \alpha}{1 - q} \end{aligned}$$

$$\begin{aligned} EU_1(H, D) &\geq EU_1(Z, D) \\ '+ 1) + 0.5\alpha &\geq 0.5 \\ qT + q &\geq 1 - \alpha \\ T &\geq \frac{1 - q - \alpha}{q} \end{aligned}$$

$$\begin{aligned} EU_1(D, D) &\geq EU_1(Z, D) \\ 0.5T + \alpha &\geq 0.5 \\ T &\geq 1 - 2\alpha \end{aligned}$$

From the conditions above, the best responses for $\sigma_{-i} = D$ are given as follows:

$$BR_i(D) = \begin{cases} D & if\ T \geq \frac{q-\alpha}{1-q}, \\ H & if\ \frac{1-q-\alpha}{q} \leq T \leq \frac{q-\alpha}{1-q} \\ Z & otherwise \end{cases}$$

Note that $\frac{1-q-\alpha}{q} \leq 1 - 2\alpha,\ \forall q$.

When $\sigma_{-i} = Z$

$$EU_1(H, Z) = 0.5q(T + 1) + 0.5\alpha$$
$$EU_1(D, Z) = 0.5 + \alpha$$
$$EU_1(Z, Z) = 0.5T$$

As before, the conditions where provides σ_i higher payoffs than σ_i' given $\sigma_{-i} = Z$ are shown below:

$$\begin{aligned} EU_1(H,Z) &\geq EU_1(D,Z) \\ 0.5q(T+1)+0.5\alpha &\geq 0.5+\alpha \\ q(T+1) &\geq 1+\alpha \\ T &\geq \frac{1-q+\alpha}{q} \end{aligned}$$

$$\begin{aligned} EU_1(Z,Z) &\geq EU_1(D,Z) \\ 0.5T &\geq 0.5+\alpha \\ T &\geq 1+2\alpha \end{aligned}$$

$$\begin{aligned} EU_1(Z,Z) &\geq EU_1(H,Z) \\ 0.5T &\geq 0.5q(T+1)+0.5\alpha \\ 0.5T(1-q) &\geq 0.5q+0.5\alpha \\ T &\geq \frac{q+\alpha}{1-q} \end{aligned}$$

From the conditions above, the best responses for $\sigma_{-i} = (Z)$ are given as follows:

$$BR_i(Z) = \begin{cases} Z & if\ \ T \geq \frac{q+\alpha}{1-q}, \\ H & if\ \ 1+\alpha \leq T < \frac{q+\alpha}{1-q} \\ D & otherwise \end{cases}$$

Note that, for $q \geq \frac{1}{2}, \frac{q+\alpha}{1-q} \geq 1, BR_i(Z) = Z$ is not feasible as T has to be less than or equal to 1. The best response function of Z can be rewritten as:

$$BR_i(Z) = \begin{cases} H & if\ \ T \leq 1+\alpha, \\ D & otherwise \end{cases}$$