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Ryan Gibbons April 2, 2024

By Virtue Or By Vote: Modeling Impacts of State Accountability and Regime Type on Crisis Responses

by

Ryan Gibbons

John Patty, PhD

Adviser

Political Science

John Patty, PhD

Adviser

Maggie Penn, PhD

Committee Member

Jack Paine, PhD

Committee Member

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Abstract

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When are democratic or authoritarian states better equipped to respond to crises? The impact of constituent accountability on democratic states, particularly its ability to draw states towards electorally popular but pragmatically inefficient policies, has long been scrutinized in comparison with the lower accountability of authoritarian regimes. Yet, in the wake of the COVID-19 pandemic, where responses varied immensely and where many democratic states were unable to effectively respond, questions of state responsiveness to crises have become central to debates of regime type. In this thesis, I construct a decision-theoretic model where a state facing a crisis must choose a responsive policy which will minimize three costs: a responsive cost, an accountability cost, and an altruistic cost. In doing so, I identify conditions wherein citizen accountability pushes a state to either enact a more-appropriate or less-appropriate response, finding that democratic states are most efficient when the citizenry's preferences are socially optimal or when the cost of responding is extraordinarily high. Conversely, I find that authoritarian states may be most efficient when the citizenry's preferences are far from optimal or when the responsive cost is low. I further model the state's incentive to under-represent the severity of a crisis and how this persuasive capacity may impact responses. Through theoretical depictions and references to COVID-19, Chernobyl, and Fukushima disasters, I expand on previous "pandering"-focused work by evaluating the capacity of accountability to improve - or hinder - effective crisis responses.

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Contents

"False starts and dead ends are inevitable in any crisis, especially one driven by a virus never seen before. By its nature, a crisis means we're not on top of it. Desperation is the mother of invention here and officials worldwide are winging it, many more successfully than in the U.S. But bold promises and florid assurances were made, day after day, from the White House and a zigzagging president who minimized the danger for months and systematically exaggerates what Washington is doing about it."

Calvin Woodward, Associated Press

April 11, 2020

When do democratic or authoritarian states respond better to crises? The policies implemented by a state are a reflection of a myriad of sociopolitical considerations - regime type, state capacity, political support, citizen compliance, and countless other relevant factors. Yet, while the study of state decision-making and institutional frameworks is relevant across virtually all governmental decisions, the recent prevalence of pressing political crises - from pandemics, to storms, to climate change, to acts of God - has brought new wind to the importance of understanding the incentives under which a state responds to a pressing concern. As global tensions rise between democratic and authoritarian systems, and as these states continue to implement greatly varying responses to a range of crises, it has become crucial to evaluate the circumstances and mechanisms that may make each more or less effective.

In this thesis, I explore the relationships between political accountability, crisis severity, and costly responses, and employ a model to demonstrate the influence these have on the responsive decisions made by a state. While much of the theoretical framework of this paper is applicable to a wide range of policy-making (and the model itself may very well prove relevant to that field), I am particularly concerned with understanding crisis scenarios wherein the response of the state is considered an immediate action, the time for information-gathering is slim (if existent), and the exact best policy is not clearly visible. I construct a decision-theoretic model analyzing a state's response in light of the nature of the crisis, the nature of their response, and their political context, identifying circumstances wherein democratic or authoritarian regime types (differentiated by their accountability structures) are more or less effective in addressing a present crisis. In particular, I emphasize the role of accountability and its relationship to concepts of pandering and good governance. This analysis defines good governance as simply playing a policy closest to nature's "best" policy.

Existing scholarship, namely the work of Canes-Wrone et al (2001), has studied pandering primarily as a tangible choice made by the state when facing a policy decision. Their work primarily focuses on a signaling game of information wherein executives are provided

with priviliged information and voters must judge their possible quality. Further empirical work, particularly focused on responses to the COVID-19 pandemic, has further qualified this electoral impact in pragmatic spheres, noting the tendency of elected officials to alter crisis response policies - particularly by avoiding negative economic shocks - based on their nearness to an election (Pulejo & Querebín 2020). It is generally agreed, then, that mechanisms of accountability are an important factor in responsive policy-making, a notion rooted in normative theory: an accountable state is subject to making choices given the will of the people. However, these mechanisms can either greatly harm or hurt effective decision-making. The levers of pandering may be quite effective in producing high-quality outcomes in democratic states. Yet, they also incur discussions of a tyrannical majority, wherein the people desire an inefficient policy and an accountable state is pushed to enact a policy that is popular but incorrect.

This thesis seeks to expand upon this theoretical and empirical foundation, analyzing pandering not as a binary choice but rather as a constant reflection of the ubiquitous presence of political accountability. In this sense, I posit that pandering does not *sometimes* happen; rather, that every continuous-domain decision involves a genuine consideration of the desires of the populace. The question is not *if*; rather, it is *how*. I tie pandering, accountability, and crisis response to analyze when and where democratic or authoritarian regimes may be best situated to respond. Furthermore, I expand from Canes-Wrone's explanation of pandering as a movement away from an ideal policy, and demonstrate instead how the influence of accountability mechanisms can sometimes pull policies closer to the known best point. In doing so, I intend to provide a foundational understanding of accountability and crisis response that can both expand field discussions of accountability and lend insight into building efficient and resilient institutions for future crises. Furthermore, this model lends additional insight not only into when pandering might occur, but also under what circumstances mechanisms of accountability may either support or detract from high quality responsive policies.

Though many - though not all - of the assumptions and mechanisms captured in this thesis can be expanded towards broader models of policy-making, this model is specifically intended to evaluate responses to crises. There are a few critical points of a crisis that are both important to define and central to the motivations of this paper:

- Policies are responsive and immediate. In a crisis scenario, a state does not have the luxury of time to make significant institutional changes nor to immediately alter the nature of the crisis. There is not sufficient time nor capacity for many of the parameters of the model to be changed by the state once the crisis has begun, and the parameters that can be adjusted generally cannot be shifted in the period of time available. For example, I do not model the potential of the state to change the importance or costliness of a response. Rather, the state must optimize with the parameters given. Models of preparatory policy are certainly relevant to crisis response; this model does not attempt to encapsulate those considerations.

- Payoffs are short-term. States facing crises, though they may have some consideration of the longer-term impacts of their decisions, are under a tremendous amount of pressure to consider immediate impacts. Though costs of accountability may represent a longer-term consideration, the game is single-period because the focus on the crisis and the response itself are rapidly present. For example, many models of pandering or accountability are multi-period games where a state will face a re-election stage. However, because these scenarios are incredibly prominent and many costs are incurred immediately, I model crises in this one-period way.

- Crisis responses are costly. A state cannot respond to a crisis for free - rather, policies responding to a crisis all come with some degree of frictional implementation cost. Because of this, the state has an additional motivation to minimize their response because any response comes at an expense. For example, to impose mask mandates requires administrative burden and supply concerns, while to implement evacuations

requires service and infrastructure investments. I accordingly consider this cost to increase linearly as severity increases, a reflection of its tie to investment. Crises can be more or less costly to respond to, certainly - the cost of clearing a traffic jam is almost certainly much less than the cost of responding to a pandemic - and this costliness of response will become a significant parameter as the model unfolds.

This thesis will evaluate crisis response by regime types by analyzing the nature of the crisis, the costliness of responding to it appropriately, and the will of the citizenry. In doing so, I utilize a continuous, one-dimensional domain of policy responses ordered by relative severity, and model decision-makers under crisis as being subjected to three primary costs: the actual cost of a response, the cost incurred by inappropriately responding, and the political cost imposed by the citizenry. The state then plays a policy to minimize the overall costs of their response given the values of these parameters. I will show that a democratic state may be more effective at responding to crises when the will of the citizenry closely reflects the actual "best" policy, or when the cost of a response is so high that a less-accountable state would be hesitant to incur it. On the contrary, I will show how an authoritarian state becomes incentivized to best perform when the preferred policies of the citizenry are significantly different than what is actually necessary, or when the cost of a response is incredibly low. Finally, I will demonstrate how the state may be incentivized to convince the citizenry that the crisis is less severe than it actually is, and how this influence may ultimately affect the quality of a regime's response.

To accomplish this, I first briefly discuss the theoretical framework of crisis response, pandering, and democratic inefficiency. I then build, solve, and analyze a model of crisis response, and present conditions defining the optimal regime type given a certain crisis. I further discuss the persuasive capacity of the state and its impact on responsive policies, highlighting an incidental extension of the model. Lastly, I discuss the potential applications of this research and how future scholars might best pursue extensions of the model and its

conceptual base. Throughout this paper, I make occasional use of real-world case studies, most prominently, the COVID-19 pandemic response in the United States, and comparisons between the Fukushima Daiichi and Chernobyl nuclear disasters. These disasters are incredibly complex, and the relationship of any parameter in my model to each of them could fill dissertations; therefore, I do not intend to comprehensively study them. Instead, they briefly supplement the model and explain the translation of its mechanisms into tangible crisis policy spaces.

1 Context & Crises

In their foundational 2001 paper, Canes-Wrone et al establishes an intricate model of pandering built on a handful of primary mechanisms. They outline a scenario wherein a state is facing a binary policy decision, is provided with privileged information about a probablistic state of the world, and is further challenged by an incumbent of known quality. (They further assume that the state of the world will be revealed to the populace prior to election with a given probability.) Given these circumstances, they identify outcomes wherein the state follows (or fails to follow) their binary signal due to the electoral incentives present. Subsequently, the citizenry updates their priors about the quality of an incumbent, and vote for the candidate they believe most likely to be high quality.

This paper is built out of Canes-Wrone et al's conceptual sphere, but takes a different approach both by avoiding evaluation of a binary pandering choice and by focusing specifically on crises. In evaluating responses, I present a continuous - rather than binary - domain of policies; namely, I model that a state can implement any positive level of *investment*. This is because in most practical crisis situations, the state is not faced with a decision of whether or not to act, but rather, how intensely to act. For example, in light of the COVID-19 pandemic, a state is not faced with the choice to either respond or not respond, but rather,

the *degree* to which they will respond. They may advertise encouragements of hand washing, impose mask mandates, restrict travel, create military-enforced lockdowns, or anything in between. As will be seen shortly, I model responses one-dimensionally through intensity[1]; in other words, a state is only choosing how significantly to respond rather than specifically what responses to impose. This is an important consideration, as in practical contexts a state may impose a "correct" intensity in an incorrect format; for the sake of analysis, I fix responses in a one-dimensional domain, and thereby construct this model only referencing continuous-domain policies.

As a last contextual consideration, I consider two divergences from Canes-Wrone et al's model in considering the nature of a policy crisis. First, I posit that neither the state nor the citizenry is given explicit information about the state of the world; rather, nature provides a signal. However, while Canes-Wrone et al present a binary state of the world and an according signal, because I model responsive policies as a continuous domain, I instead propose that a signal takes the form of a normally-distributed probability density function. This distribution describes the probable state of the world, where the state of the world represents the absolute best policy possible to the state with regards to "solving" the crisis. (This is later referred to as the "absolute ideal policy" or "absolute ideal point.") We assume for simplicity of analysis that this ideal point takes into account citizen compliance (and therefore removes considerations of noncompliance). This presence of uncertainty is key to the model and pragmatic crisis response, as in virtually all policy scenarios there is not an obvious, absolutely certain optimal response, and a state is rather attempting to achieve the best outcome possible given incomplete information. Second, I do not provide the state with privileged information. While this assumption may somewhat falter in authoritarian contexts, I assume that information regarding ideal responses in all but the most extreme circumstances of authoritarianism (or the most immediate responses) either begins as common knowledge or becomes common knowledge quickly enough. Authoritarian

[1] or "severity," or "investment"

governments are certainly not known for their free and fair distribution of information, but given a non-national-security-related crisis, reasonable information can be generally assumed to spread.

Though many - though not all - of the assumptions and mechanisms captured in this model can be expanded towards broader models of policy-making, this model is specifically intended to evaluate responses to crises. There are a few critical points of a crisis that are important to define in the context of this model:

- Responses are immediate. There is not sufficient time nor capacity for many of the parameters of the model to be changed by the state once the crisis has begun, and the parameters that can be adjusted generally cannot be shifted in the period of time available. For example, I do not model the potential of the state to change the importance or costliness of a response. Rather, the state must optimize with the parameters given.

- Payoffs are objective and short-term. Though costs of accountability may represent a longer-term consideration, the game is single-period because the focus on the crisis and the response itself are rapidly present. For example, many models of pandering or accountability are multi-period games where a state will face a re-election stage. However, because these scenarios are incredibly prominent and many costs are incurred immediately, I model crises in this one-period way.

- All responses are costly. Because we consider a state's investment to be equivalent to their crisis severity, we can further acknowledge that any response but the state incurs a cost. (We consider this independently from political costs, which are outlined later; rather, this references the simple cost of enactment.) This is rather simple to logically prove. Imposing any policy aside from the status quo requires some expense; for example, to impose mask mandates requires administrative burden and supply concerns,

while to implement evacuations requires service and infrastructure investments. I accordingly consider this cost to increase linearly as severity increases, a reflection of its tie to investment. Crises can be more or less costly to respond to, certainly - the cost of clearing a traffic jam is almost certainly much less than the cost of responding to a pandemic - and this costliness of response will become a significant parameter as the model unfolds.

2 Political Accountability & Tyrannical Majorities

The notion that politicians are inherently (at least partially) office-motivated is both a given of human nature and a prerequisite for good governance: a government with no threat of removal faces no incentive to act under any interest but its own. Just as a democratic leader may be motivated to act for the general will under the threat of electoral ousting, so may an autocrat be motivated by the threat of rebellion. Yet, while office-focused motivations can force a governmental commitment to act aligned with the will of the people, this notion presents a critical problem: if the will of the people is inconsistent with the absolute best policy, leaders may be incentivized to implement electorally popular but socially inefficient choices. This is a phenomenon known as "pandering." Pandering is especially relevant in the face of particularly accessible institutions of accountability, such as representative democracies, wherein the ease of removal of a government necessitates a closeness to the ideal policies of the citizenry. Centuries of theorization have focused on this tradeoff: political accountability (and the institutions that deliver it) pushes governments away from policies which ostensibly detriment the good of the people, but may divert focus from making effective choices to making popular ones. It can therefore both deliver and hinder socially-optimal outcomes, even before invoking normative arguments of natural rights and democratic values.

The personal desire to be in office, the benefits from holding office, and the various

costs associated with losing office - embarrassment, career prospects, or even threats to safety - guarantee the ubiquitous nature of office-motivated factors. Yet, the ways in which those factors propagate (and accordingly, the effects they have on policy outcomes) vary greatly across institutional contexts. Representative democracies and autocracies, by far the most common forms of modern government globally, are inherently differentiated by their mechanisms of accountability. Based on these mechanisms, I broadly define two core forms of government in this model: democracies, wherein governments face credible, free, and fair elections (this includes representative democracies); and autocracies, wherein governments do not face legitimate electoral threats. (I hold direct democracies, a purely hypothetical control wherein decisions are made by direct votes, as representing a system with no electoral controls wherein the will of the citizenry is directly implemented as policy.)

Autocracies do not face the threat of electoral ousting, but are still subject to motivations to maintain their tenure. An authoritarian government does not act with absolute power, a notion repeatedly proven by the collapse of centralized states throughout human history. Rather, they are primarily threatened by the risk of extra-legal and likely unstable means of ousting. This usually takes the form of rebellion, uprising, or coups, wherein some subset of the populace acts to forcibly remove the government from power. Yet, doing so is often incredibly costly. Rebellion comes at great personal risk and a high cost of action, forming a collective action problem wherein citizens are largely incentivized not to participate unless either a) success seems incredibly likely, b) the risk of personal loss is low, or c) the status quo is sufficiently poor enough that the risk of rebellion outweighs the potential costs. Condition (a) is a metric of stability, which we for now assume to be constant across states; and condition (b) can be assumed to be unlikely as most effective autocracies employ harsh means of repression. This necessitates that under most circumstances, meeting condition (c) is the most likely path towards enabling rebellion. As a result, while the method of removal for an autocracy is usually quite eventful, it requires a relatively high degree of discontent from the citizenry to invoke.

Conversely, while democracies do face threats of overthrow or uprising, their primary means of political accountability occur through elections. Citizens vote in recurring periods to choose their representatives, tying office-motivated leaders to electoral motivations as they may risk losing their tenure if their leadership is inconsistent with the will or good of the people. Democratic leaders must be cognizant of the will of the citizenry throughout their term, but especially approaching elections, as an incongruency between the state and the citizenry can be credibly expected to increase chances of removal. Various forms of representative democracy may enable this accountability to different degrees; for example, parliamentary systems can diffuse accountability from individual leaders as the head of state is not directly elected by the general populace. A prime minister may therefore face marginally reduced electoral accountability compared to their presidential counterparts, but as political sentiments are still reflected through the election of individual representatives, a credible electoral threat is still present. While this electoral mechanism is centered around intermittent elections, credible risks are maintained throughout an entire term through three forms: a) the citizenry does not entirely forget the actions of the state throughout a term, b) other non-electoral institutions (such as courts, votes of "no confidence," or recall elections) are often present in some capacity, and c) in the case of particularly egregious exploitation or abuse, uprising and overthrow can be pursued just as in an autocratic setting.

This leads to a critical discussion of tyrannical majorities. Though the exact application of the term varies, the notion of a "tyranny of the majority" is commonly used to discuss the ability of a democratic system to create unjust results simply by satisfying some majority group. The concept of the tyranny of the majority is hardly novel in political philosophy; Tocqueville highlighted in his early-19th-century work "Democracy in America" its risks to effective governance, while John Adams' "A Defence of the Constitutions of Government of the United States of America" and James Madison's "Federalist #10" both present hesitation to an unchecked democratic system on the basis of this risk. Madison states:

> When a majority is included in a faction, the form of popular government, on the

> other hand, enables it to sacrifice to its ruling passion or interest both the public good and the rights of other citizens. To secure the public good and private rights against the danger of such a faction, and at the same time to preserve the spirit and the form of popular government, is then the great object to which our inquiries are directed. (Federalist #10)

Though historical discussions of tyrannical majorities have often focused on the potential for the legislative oppression of minorities, the concept can be considered much more broadly. Note Madison's mention of the interest of "the public good" - a reference to the ability of a self-interested majority to govern in a way inconsistent with optimal decision-making. In other words, the discretion given to the majority by a democratic system can create inefficient policy outcomes if the populace, in accordance with the voting system present, desires a policy that conflicts with the common good. In this way, a regime that is more accountable to the will of the people may be swayed further from an ideal policy if the citizenry desires a sub-optimal policy. This may not always be the result of malice or even the promotion of self-interests; rather, incomplete information, distrust in the state, or unequal distribution of costs may all result in this separation.[2]

There are two primary manifestations of this separation, and the model will explore both of them. First, we consider circumstances wherein the citizenry desires a less intense response than may be appropriate given the crisis. In such an instance, the citizenry may be either insufficiently convinced of the severity of a crisis, or may be encountering a free-riding problem wherein the individual costs that an adequate response would incur are unappealing and therefore the aggregate preference is insufficient. This can influence the state to under-respond to a crisis, as the citizenry would hold them accountable to a less-than-sufficient investment or response. Second, we consider circumstances wherein the citizenry desires a more intense response than would be appropriate. This may be considered to represent

[2] A comedic-yet-relevant George Carlin quote: "Think of how stupid the average person is, and realize half of them are stupider than that."

populism or mob rule, wherein the citizenry perceives a crisis to be a bigger threat than it actually is and desires an overly-intense response. In circumstances such as this, the state may be influenced to over-respond to a crisis; at the same time, because all responses are costly (as I discuss momentarily), this over-intense response may actually balance out this costliness to incur a more appropriate response. The solution to the model will make clear the complexity of this case, as this necessitates a balance of costs.

As a result of this discussion, I impose on every state a cost that increases quadratically as a policy enacted differs more from the ideal point of the citizenry, reflecting a progressive penalty incurred as a state becomes less aligned with the will of the people. We use a quadratic model to represent both the incremental losses than any difference creates (losing party seats, electoral margins, etc.) and the substantial losses that large differences can result in (electoral ousting, overthrow, unrest). In reality, these costs tend to be somewhat segmented; a democratic government maintains their tenure until a single vote removes it. However, because of the benefits enjoyed by states with greater political support, social cohesion, and majoritarian margins, we can impose a continuous increasing cost. Through this evaluation of democratic versus authoritarian means of political accountability, we reach a significant theoretical conclusion: although regime ousting is much more dramatic in an authoritarian setting, the level of discontent which must be reached to motivate such ousting can be expected to be much greater than in a democratic state. More simply put, the cost incurred by a democratic government increases more rapidly at smaller differences from the citizenry's ideal point compared to authoritarian counterparts. We can accordingly posit that, given equivalent levels of political stability, an authoritarian state can play a wider range of policies further from the citizenry's ideal point than democratic states.

Out of this discussion, I identify two crucial theoretical propositions. First, because an authoritarian state has a wider domain of playable policies relative to the ideal point of the citizenry, they may be better equipped to implement unpopular policies which are necessary

to the common good. In circumstances wherein the citizenry's ideal policy is significantly different (usually lesser) than nature's signal distribution, an authoritarian state's reduced immediate dependence on constituent support can enable solution-oriented policies. However, authoritarian states are not always policy-efficient[3], and democratic incentives remain relevant forms of political accountability. This leads to our second proposition: in the face of costly responses, democratic states may be pushed to implement more effective policies than authoritarian states when the citizenry's ideal point is more aligned with the signalled state of the world. Because responses are costly, a state may be generally incentivized to under-respond; however, in the face of electoral pressure aligned with an optimized response, a response may become more effective.

3 The Basic Model

3.1 Actors & Interests

The key actor in this model is the state. The state is enabled to construct and implement their policy choice equally throughout their sovereignty. In addition to the electoral and policy incentives previously discussed, I make a few core assumptions about the actions of the state.

First, I model the state to be one singular, cogent actor. In an authoritarian state, this is rather obviously the autocrat or ruling group; in a democratic state, this can be considered to be either the singular elected administration in a pure-presidential system, the ruling party or coalition in a parliamentary system, or simply the conglomeration of those elected and in majority-powerful positions. I further do not incorporate internal limitations

[3]The logical motivation here is quite simple. If authoritarian states were consistently better at crisis-response, we would see more global flourishing of that system. Even more explicitly, as this paper will later demonstrate, there are countless examples of autocratic states underperforming democratic competitors in policy responses.

on the state's decision-making authority, *independent from external challenges to regime power.* In other words, the limitations formed by institutional restrains on authority - for example, constitutional courts, separation of powers, or supermajoritarian thresholds - do not create additional boundaries within this model as they are already encapsulated in the accountability parameter. The frictional effects of these interactions - as well as the potential for constitutional or legal challenges from non-legislative groups - is incorporated in the model's description of accountability and political costs. Lastly, I assume that the state's capacity is sufficient to implement the absolute ideal policy (since this policy is itself a reflection of the state's best play), and that costs associated with a lack of capacity are accounted for in the model's continuously increasing policy cost - namely, that if a state has a lower capacity, it faces a higher cost of implementing a given policy than a higher-capacity state.

The tenure-focused motivations of the state have already been established; namely, the state enjoys a benefit from acting in line with the public's interests (or, more appropriately, incurs a cost consistent with how far they act from the public interest). I further model that the state benefits from properly addressing a policy need or crisis - that they do benefit from playing a correct response. This consideration encompasses three central mechanisms: a) long-term legacy or political benefits from productive leadership, b) the desire of the state itself (or its aggregate actors) to minimize personal loss to an unmet policy need[4], and c) a genuine desire to respond effectively that I argue is consistent with *altruism.* This is critical in providing some reason for the state to act in the general interest when it differs from the public interest. For ease of analysis - and to reaffirm that this model does not present cutoff thresholds for action, since the state must act on a continuum (including inaction as a possible choice) - the state's payoff is modeled as costs; the best response for the state is to minimize their overall cost. I assume that this specific cost is symmetric and

[4]For example, in a pandemic, a leader is at least partially motivated by their own desire to not become ill or perish.

therefore determined only by the magnitude and not direction of the difference between a state's policy and the state of the world; namely, that it is not worse to over-or-under-react. (This is because the additional cost incurred by an overreaction is already included in the parameter reflecting that all responses are costly.) This is demonstrated by the separate costs included within the model and will be critical in enabling its reasonable solution.

In this model, the citizenry is a non-strategic actor, and their preference is set by nature. This is because the citizenry represents an aggregation of the preferences of each individual citizen and represents objective preferences. I further model the payoff of the citizenry to be symmetrically quadratic based on the distance from their ideal point, reaffirming that there is no strategic incentive for the citizenry to shift their own preferences.[5] The citizenry is rational, policy-motivated, and has single-peaked preferences, but citizens do not adjust their ideal policies in anticipation of the state's response; rather, they simply hold a preference for their ideal policy response. In a similar way to the state, we aggregate all citizens into the singular "citizenry" as we are less concerned with the strategic actions of the voter and more concerned with the state's response given the general position of the populace. (The model's political cost functions can further account for the dispersion of citizen's individual preferences, as they may be considered to be reflected in the stability and legitimacy of the state.) Because the citizenry does not act strategically and merely exists as a set ideal point given the signal provided by nature, the payoffs set for the citizenry do not fundamentally

[5]Importantly, the citizenry would also incur some benefit from the policy enacted being close to the state of the world - i.e., they benefit from decisions based on their welfare. This discussion draws heavily on Canes-Wrone et al (2001), who model this observed nearness to the state of the world as being influential in the citizenry's decision to re-elect the incumbent or not. This consideration is critically important for an extended-form game wherein the political and altruistic costs of an action unfold over time, and not necessarily simultaneously. Because I model crisis response as a one-shot decision theoretic game, I assume that all actors are interested primarily in the immediate consequences of their actions. Furthermore, as there is no re-election period in this game at present, the actual costs incurred by the citizenry are not particularly relevant. However, future modeling - particularly theoretical work focused on expanding discussions of responsive policymaking to extended-form or delayed-payoff formats would be wise to note that the ultimate payoff of the citizenry is also influenced by the altruistic impact of the policy. And, any extensive-form game where the citizenry makes a play based on their welfare gained would likely need to include this consideration - that the citizenry also benefits from good policymaking - to achieve validity. Discussions of this future inquiry is more extensively explored in section 5 of this thesis.

change the solution to - or conclusions of - the model and merely clarify the citizenry's role.

One final discussion is the relationship between the costs incurred by the state and the costs incurred by the citizenry. In this model, I assume that all responses are costly - namely, that an investment is not free, and the state incurs some cost in implementing any response. However, the state and the citizenry, though modeled here as independent actors, are not necessarily completely distinct in bearing the cost of a policy. For example, any investment made by the state is generally reflected as the allocation of budgets or tax dollars towards the crisis; in this way, these costs are at least partially - albeit probably delayed - incurred by the citizenry as well. As a result, it could be true that the citizenry's preferences would not be entirely symmetric and would instead reflect the possible enhanced costs of an over-reaction by preferring responses less likely to go beyond the state of the world. However, this would likely simply shift existing boundary points and adds additional noise to the discussion of the citizenry's presence. (Not to mention, the citizenry has likely already considered these costs in their own aggregated preference.) For these reasons, I do not model a direct link between the responsive costs incurred by the state and the nature of the citizenry in paying for those costs, but acknowledge them as a consideration in applying this model to pragmatic policy scenarios.

3.2 Setup

Setup

I model a single-period game which models an instantaneous point in time for a state facing a policy-needing crisis. In this period, Nature draws the state of the world $\bar{x}$, where $\bar{x} \geq 0$. The state of the world represents the absolute ideal policy point with regards to addressing the crisis; in other words, it is the maximal alternative from the set of all possible policies, and no other policy or investment would solve the crisis more completely. In this

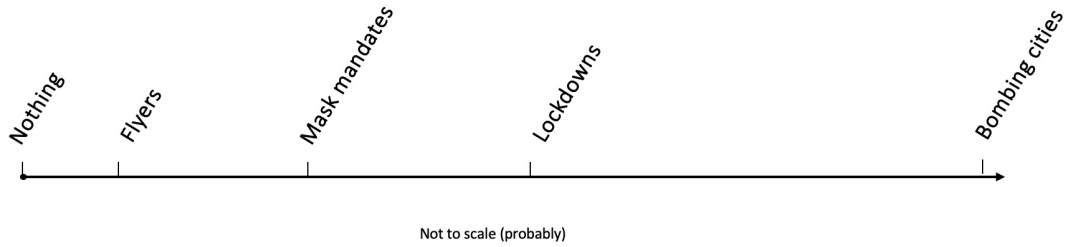
paper, I consider this value to be the "social planner's preference/optimum" as it represents the ideal point of an omnipotent and altruistic being. It captures discussions of compliance, efficiency, and all other pertinent questions - it simply is objectively the best way to solve the crisis. It is somewhat arbitrary in value, but is consistent in ordinality - for example, $x_a > x_b$ represents that the ideal policy for crisis a is a more intense and costly response than for crisis b.

In this model, I restrict all policies to a one-dimensional domain, scaled by the "severity" of the response. An actual policy choice may be more complicated - it is possible to invest a correct amount but in an indirect direction. As a pragmatic example, during the early stages of the COVID-19 pandemic, substantial care was taken towards disinfecting common surfaces, reducing communal touch-points, and enacting techniques used to combat surface-borne diseases. Even beyond general policies to reduce airbone infections, such as masks and social distancing, many policies sought to reduce points of touch. However, as the pandemic developed, further research indicated a relatively low risk of surface-based contagion and that the primary methods of infection were by far airborne particles and fluids . The severity of this attempt to reduce physical contact may have been equivalent to the severity of attempts to reduce aerial spread, but the severity of touch-reduction was not properly aimed. For the sake of this model, which seeks not to measure the informative capacities or risk-taking tendencies of regime types but instead to evaluate the willingness of the state to impose a costly response and the willingness of the citizenry to receive it, the singular, scaled domain allows analysis of this specific relationship despite the fallibility of well-scaled responses. An example of a scaled-domain response to a pandemic is depicted in Figure 1.

Nature then sets the citizenry's ideal point x_c, where $x_c > 0$. The value of x_c is not necessarily influenced by $\bar{x}$, although we might expect that a relatively well-informed and rational citizenry[6] would in most places not hold x_c incredibly far from $\bar{x}$. Three characterizations

[6]An important assumption here - the citizenry's preference consists of two things: their "selfish" desires to incur minimal costs, and their desire to actually get the response right. We can assume it is fairly unlikely that a rational citizen knowing a relative value of the state of the world and facing minimized personal costs

Figure 1:



of the relationship between $\bar{x}$ and x_c are possible, with the general interpretations of those relationships described below:

- $\underline{x_c < \bar{x}}$: The citizenry prefers a policy intervention less significant than the social planner's optimum. This may represent a possible free-riding scenario. In costly circumstances where free-riding is possible, we can make the assumption that the citizenry's aggregated ideal point will fall below the median point of nature's signal. This is because no rational citizen (ignoring considerations of personal risk aversion) will seek to incur a greater personal cost than is expected to be necessary, and many will be incentivized by the collective action problem at hand to seek a lower severity overall. (For example, if every other person socially distances, an individual's risk of infection will be lower even if they do not practice distancing themselves.)

- $\underline{x_c > \bar{x}}$: The citizenry prefers a policy intervention more significant than the social planner's optimum. This may occur in situations where free-riding is not possible or incentivized; the citizenry's ideal point may be much more fluid as there does not exist a meaningful opportunity for personal noncompliance and positive gain, and therefore citizens are not inherently incentivized to pursue less-intense responses. Alternatively, this may be the result of broader political phenomena such as populism or "mob rule."

- $\underline{x_c = \bar{x}}$: The citizenry knows exactly what the social planner's optimum is and wants

from the SOW being realized would be unlikely to prefer a policy wildly different than that value.

to enact it perfectly. There is perfect alignment between the preference of the citizenry and the state of the world. Though this is unlikely to ever perfectly happen (especially given the arbitrary nature of these parameters), the existence of this point is important as when it is satisfied, a democratic state will play a more-appropriate response than an authoritarian state *no matter the cost of a response.*

Again, while the conceptual backgrounds of these comparisons are not explicitly addressed in the model, we will see that it poses a key consideration in describing what types of crises may be better suited to democratic or authoritarian systems.

3.3 Sequence of Play

The overall sequence is as follows:

1. Nature determines state of the world $\bar{x}$ and ideal point x_c. Nature also determines λ and β
2. The state observes $\bar{x}$ and x_c, as well as λ and β. α is already known.
3. The state enacts policy $\gamma \geq 0$, played on the same domain as $\bar{x}$.
4. The state receives its payoff (as a negative cost).

Note that while the state's primary decision is not whether or not to implement a response but rather how significant of a response to enact, the state retains the opportunity to play $\gamma = 0$ and nature may very well enact $\bar{x} = 0$ as well. This represents a play of total inaction and an ideal response of total inaction, respectively.

3.4 Payoffs and Strategy

As previously mentioned, the citizenry does not play strategically. Rather, in this one-shot game, they are solely impacted by the closeness of the enacted policy to their ideal point. The citizenry will thus incur a cost

$$c(c) = (\gamma - x_c)^2$$

and does **not** attempt to optimize this value. Note that in reality, the citizenry's long-term payoff is almost certainly somewhat influenced by the value of $\gamma - \bar{x}$, as they would benefit in the long term from a proper policy being implemented. However, this simple expression of $c(c)$ merely reflects the symmetric and single-peaked nature of the citizenry's preferences, and considers the citizenry to be only motivated by the nearness of a policy to their own preferences.

The state is the only player whose actions are strategically motivated by its payoffs, all of which are modeled as costs. Note, then, that the cost incurred is always negative, and optimization involves minimizing these costs as opposed to maximizing payoffs. It incurs three separate cost mechanisms, modeled as follows:

Responsive Cost:

$$c_r = \lambda\gamma$$

Accountability/Political Cost:

$$c_p = \alpha(\gamma - x_c)^2$$

Altruistic Cost:

$$c_a = \beta(\gamma - x)^2$$

λ	α	β
Costliness of Response State Capacity[8]	Accountability Mechanisms Existing Support Political Stability Strength of Opposition	Urgency Cost of Failure Prior Action of the State
Associated value: 0	x_c	$\bar{x}$

such that the total cost c incurred by the state is

$$c(\gamma) = c_r + c_p + c_a = \lambda\gamma + \alpha(\gamma - x_c)^2 + \beta(\gamma - x)^2$$

where λ, α, and β are positive constants[7], λ represents the costliness of response, α represents the office-motivated accountability consequences faced by the state, and β represents the importance of an appropriate policy response - in other words, the severity of the crisis. As a result, a higher value of α represents a greater concern for less-forgiving political cost, and a higher value of β indicates a more pressing need for an appropriate policy response. These constants encompass a range of considerations derived from our theoretical framework:

Given that this is a static, one-shot game, the state is only motivated by minimizing its present costs. Thus, its best response will become the optimization of $c(\gamma)$ with respect to γ.

3.5 Welfare Analysis

In this paper, I am primarily motivated by comparing values of α where, as a result of the theoretical basis that authoritarian states are less accountable than democratic ones, I assume $\alpha_{auth} < \alpha_{dem}$. The other two coefficients λ and β are, in this model, representative of relevant descriptions of the nature of a crisis. Understanding the responsiveness of various systems as these values change is a critical component of applying this model to descriptively

[7]In a perfect direct democracy where all decisions are made communally, the state does not have an office-motivated risk as there is no individual holding office, and so it could be argued that $\alpha = 0$; this is essentially impossible to realistically occur.

analyze crisis response, particularly by depicting the conditions under which an authoritarian or democratic state may be better equipped to respond. The results section discusses various outcomes constructed by varying the values of λ and β.

The discussion of regime type and capability engages an incredible depth of normative arguments regarding the role of government and the responsibilities of the state. Thousands of years of political theory have explored in particular the "trustee" and "delegate" approaches to government - the former reflecting the notion that the goal of the state is to enact the best policy, and the latter, that the goal of the state is to enact the will of the people. Throughout this model, I am most interested in understanding which regime type could be expected to enact an objectively "better" policy. **I define this as a policy that is closest to the state of the world.** Any mention of "best," "efficient," or "supremacy" is not a normative assertion that a given state type is the ideal one. Rather, I am simply concerned with the distance between a best response and the state of the world, and whether a higher or lower degree of accountability (a representation of democratic or authoritarian government) would minimize this separation. Mathematically put, I define the following:

$$\text{"Democratic Efficiency" if } |\gamma^*_{a_{high}} - \bar{x}| < |\gamma^*_{a_{low}} - \bar{x}|$$

$$\text{"Authoritarian Efficiency" if } |\gamma^*_{a_{high}} - \bar{x}| > |\gamma^*_{a_{low}} - \bar{x}|$$

Throughout the model's solution, I often use minimization expressions of $(\gamma^* - \bar{x})^2$. This renders the function differentiable and non-negative, and is therefore much more workable. However, the definitions of efficiency remain the same even for those models, as the ordinal nature of these γ^* values does not change by squaring the absolute value of the results. In this case, I define the following:

$$\text{"Democratic Efficiency" if } \frac{\partial}{\partial \alpha}(\gamma^* - \bar{x})^2 < 0$$

$$\text{“Authoritarian Efficiency” if } \frac{\partial}{\partial \alpha}(\gamma^* - \bar{x})^2 > 0$$

Verbally put, if an increase in accountability shrinks $(\gamma^* - \bar{x})^2$, then it moves γ^* closer to $\bar{x}$. Therefore, a more-accountable (democratic) state would perform closer to $\bar{x}$ than a less-accountable (authoritarian) state. Then, this is “democratic efficiency.” However, if an increase in accountability increases $(\gamma^* - \bar{x})^2$, then it moves γ^* further from $\bar{x}$. Therefore, a more-accountable (democratic) state would perform further from $\bar{x}$ than a less-accountable (authoritarian) state. Then, this is “authoritarian efficiency.” This partial-derivative-based characterization becomes critically important in the solution process to the model.

4 Results & Propositions

4.1 The General Solution

To identify a general solution to the model in the form of γ^*, the state's best-response policy, we can simply minimize the state's cost function with respect to γ. As a result, we can solve:

$$\gamma^* = \arg\min_{\gamma} c(\gamma)$$

$$\frac{\partial c}{\partial \gamma} = \lambda + 2\alpha(\gamma - x_c) + 2\beta(\gamma - \bar{x})$$

$$\text{Set } \frac{\partial}{\partial \gamma} c(\gamma) = 0, \gamma^* \rightarrow \frac{-\lambda + 2\beta\bar{x} + 2\alpha x_c}{2(\alpha + \beta)}$$

Recall that we impose the condition $\gamma^* \geq 0$ - namely, that a state cannot play a negative response. Therefore, if the solution of γ^* lends $\gamma^* < 0$, the best response of the state becomes $\gamma^* = 0$. We therefore have a corner solution:

$$\frac{-\lambda + 2\beta\bar{x} + 2\alpha x_c}{2(\alpha + \beta)} = 0$$

$$\lambda = 2(\alpha x_c + \beta\bar{x})$$

If $\lambda \geq 2(\alpha x_c + \beta\bar{x})$, then $\gamma^* = 0$. Note that as either α or β increase, this threshold becomes progressively higher. More importantly, note that becuase a democratic state has a higher α than an authoritarian state, facing identical crises, an authoritarian state will hit this corner solution sooner (with a lower value of λ) than a democratic state will.

4.2 Some Useful Limits

Throughout this section, we will be repeatedly interested in the value of γ^* as certain parameters approach extreme values. Though I discuss the intuition behind each circumstance throughout this section, a few key expressions are particularly useful, and I present them under Lemma 1:

Lemma 1: For any values where only one parameter approaches infinity, the best response will approach that parameter's associated value.[9] We can demonstrate this by evaluating limits, which are listed as Proofs #1-3 in the appendix.

$$\lim_{\alpha\to\infty} \gamma^* = \lim_{\alpha\to\infty} \frac{-\lambda + 2\beta\bar{x} + 2\alpha x_c}{2(\alpha + \beta)} = x_c$$

$$\lim_{\beta\to\infty} \gamma^* = \lim_{\beta\to\infty} \frac{-\lambda + 2\beta\bar{x} + 2\alpha x_c}{2(\alpha + \beta)} = \bar{x}$$

$$\lim_{\lambda\to\infty} \gamma^* = \lim_{\lambda\to\infty} \frac{-\lambda + 2\beta\bar{x} + 2\alpha x_c}{2(\alpha + \beta)} = 0$$

[9] See the table in section 3.4 for "associated values".

4.3 Modifying Responsive Cost

We can explore the accuracy of this expression quite easily. First, let us modify the costliness of a response, and evaluate how this expense is reflected in the state's best response. As we will see later in this paper, it is generally simpler to evaluate circumstances where $\bar{x} > x_c$, as it ensures that a regime type will be unilaterally efficient. I demonstrate below, first applying this general solution to variations of λ:

No-cost response, with equal office and altruism incentives:

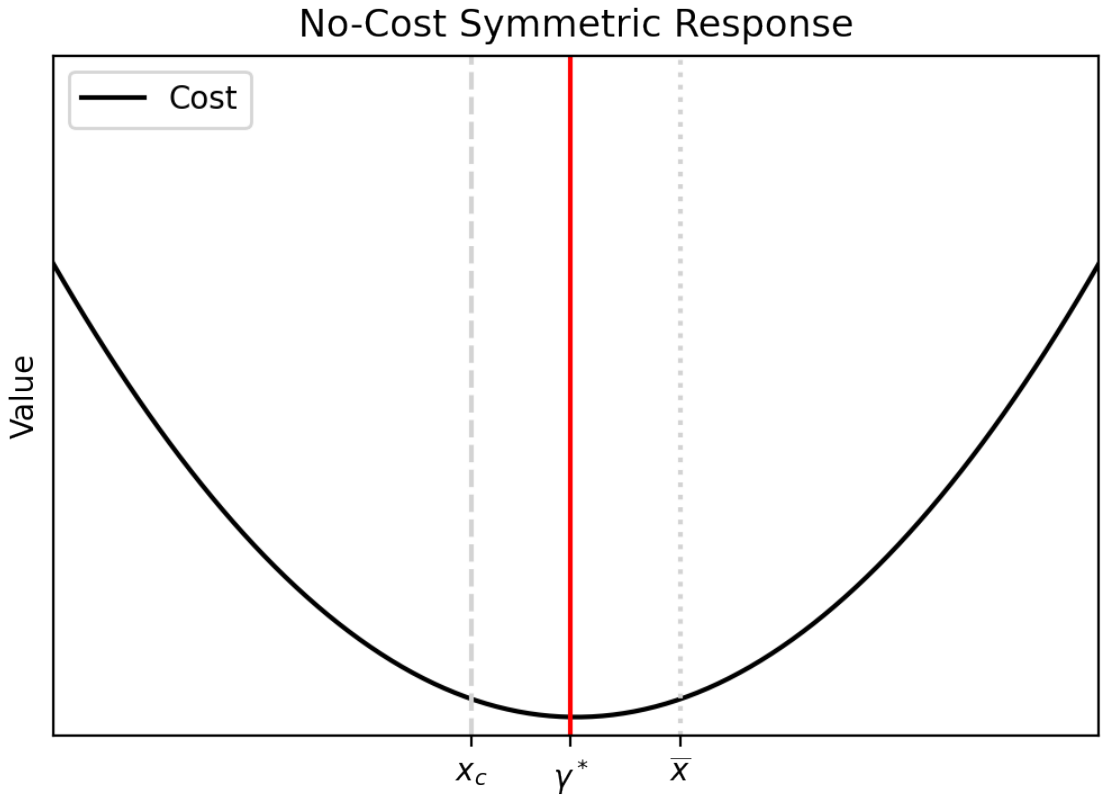
$$\gamma^* | \lambda = 0, \alpha = \beta, \bar{x}, x_c = \frac{2\beta\bar{x} + 2\alpha x_c}{2(\alpha + \beta)}$$

$$= \frac{\alpha(\bar{x} + x_c)}{2\alpha} = \frac{\bar{x} + x_c}{2}$$

Verbally, this demonstrates that if there is no cost to a response and a state can choose any value of γ without reflexive cost, and if office-motivated and problem-solving incentives are equivalent, then the ideal point for the state to play is the mean of the citizenry's ideal point and the most likely state of the world. Similarly, if we remove the condition that $\alpha = \beta$, this would then simply become a weighted average and the equilibrium would shift towards the value of x_c or $\bar{x}$ with the stronger associated parameter α or β, being more influenced by the more-substantial motivator. This logically holds.

This context describes very plainly the foundational tradeoff of governmental accountability: that if the will of the people diverges from the actual best policy, an accountable government will be swayed proportionately to act further and further from the state of the world. This is not a particularly ingenious result, but does a fairly solid job at proving the obvious: we can see from this that for more accountable states with a higher value of α, the equilibrium will shift closer to x_c - and thus, further from $\bar{x}$ - than a less-accountable counterpart. I explore this relationship and its implications on regime efficiency later in this

Figure 2:



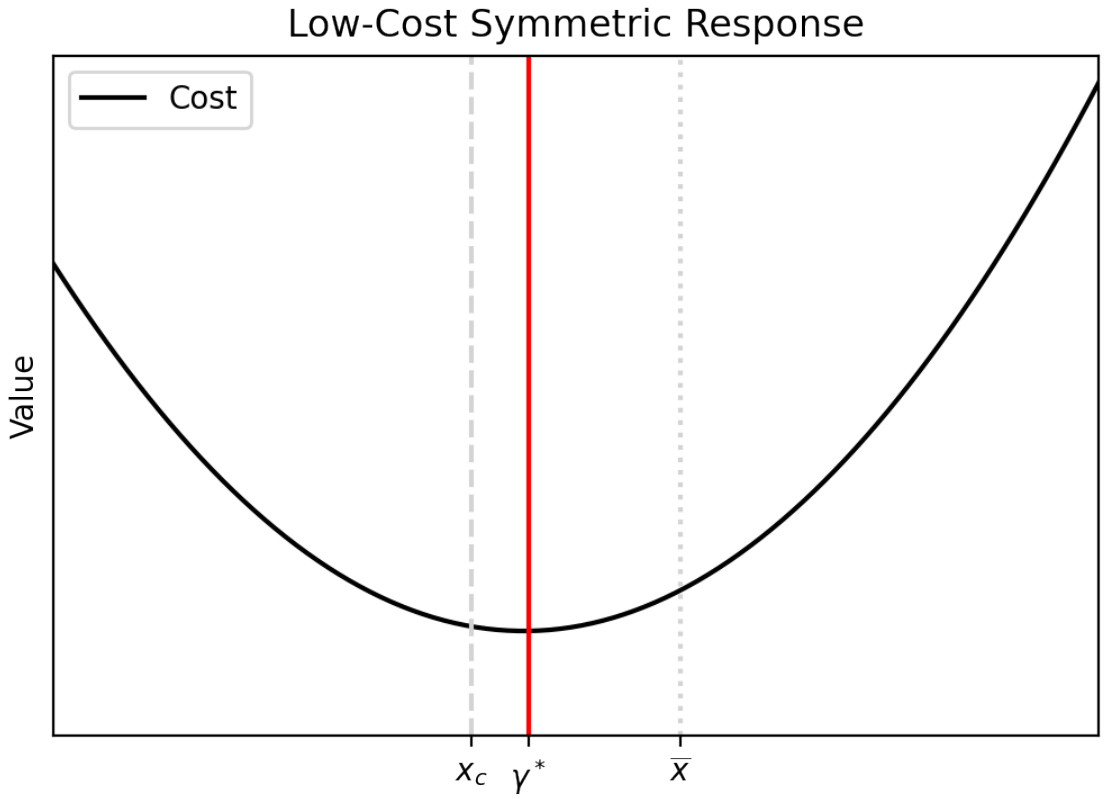
paper.

Costly response, with equal office and altruism incentives:

$$\gamma^*|\lambda, \alpha = \beta, \bar{x}, x_c = \frac{-\lambda + 2\beta\bar{x} + 2\alpha x_c}{2(\alpha + \beta)}$$

$$= \frac{-\lambda}{2(\alpha + \beta)} + \frac{\bar{x} + x_c}{2}$$

Figure 3:



This follows from the same discussion as the no-cost response, except that the best response point of the state lies some point below the mean of $\bar{x}$ and x_c (or the weighted mean, if $\alpha \neq \beta$). Such an outcome is to be expected, as the additional progressive cost of any action played by the state would add an incentive to play a lower value of γ. This, too, logically holds, and just as in the no-cost response, if we remove the constraint that $\alpha = \beta$,

we would simply see the equilibrium shift towards the stronger factor.

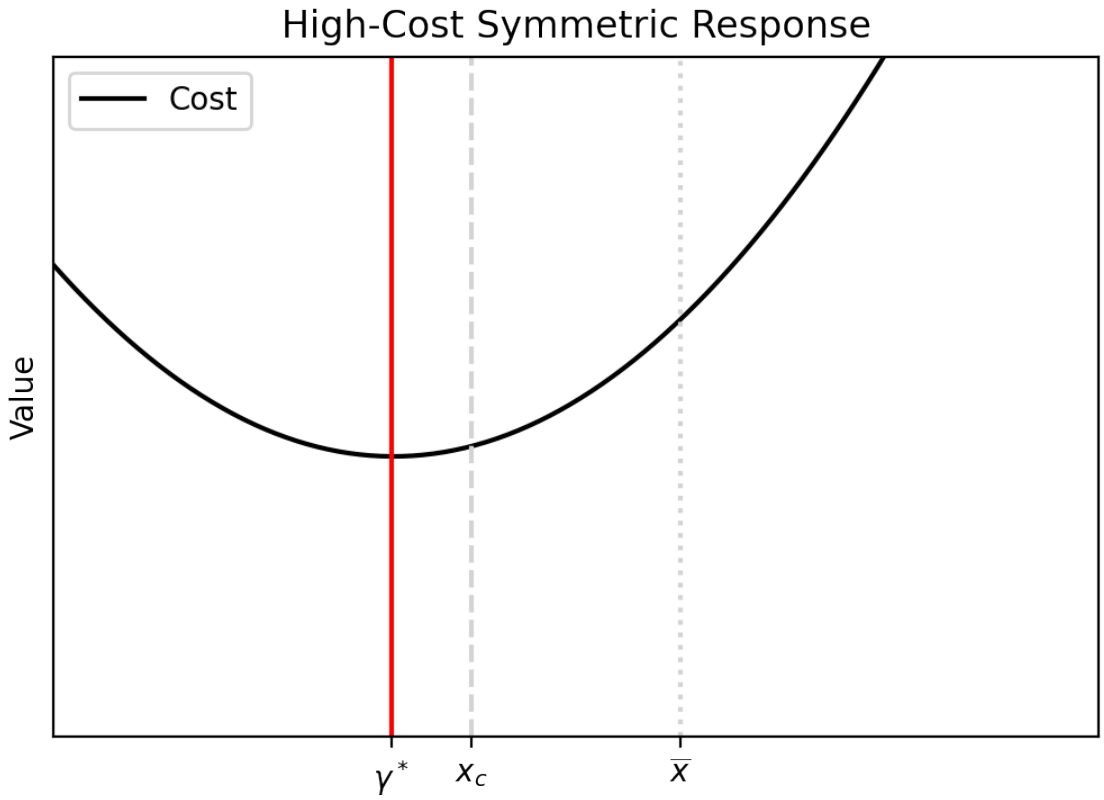
Note that this begins to introduce an additional - and important - layer of theory into the existing discussions of an accountability tradeoff. Namely, there exists a cost of response that complicates the determining of the best-equipped regime type to respond. Let us see this in the next scenario:

High-cost response, with equal office and altruism incentives:

$$\gamma^*|\lambda, \alpha = \beta, \bar{x}, x_c = \frac{-\lambda + 2\beta\bar{x} + 2\alpha x_c}{2(\alpha + \beta)}$$

$$= \frac{-\lambda}{2(\alpha + \beta)} + \frac{\bar{x} + x_c}{2}$$

Figure 4:



The solution to this expression is equivalent to the low-cost response, simply with a higher value of λ. However, it demonstrates a phenomena that becomes critical in understanding crisis response: when the cost of responding is sufficiently high, a circumstance can arise where not only is the best response of the state below the state of the world, but it is *also* below the ideal point of the citizenry. As I explain later in this paper, this represents an important threshold as x_c and $\bar{x}$ are no longer in opposite directions of magnitude from γ^*.

It is also important to acknowledge that, while I generally describe this as a reflection of a very costly response (a high value of λ), this phenomenon could also occur when the value of $\bar{x}$ is very high, such that for even a low (but non-zero) value of λ, γ^* is still shifted below both x_c and $\bar{x}$. Regardless of whether the value of λ or $\bar{x}$ is ultimately responsible for this context, the conceptual point is that there exists circumstances where the state's best response is lower than both the state of the world and the citizenry's ideal point.

Proposition 1: The partial derivative $\frac{\partial \gamma^*}{\partial \lambda}$ is always negative. Therefore, higher costs of response implementation push the state to enact less-severe policies.

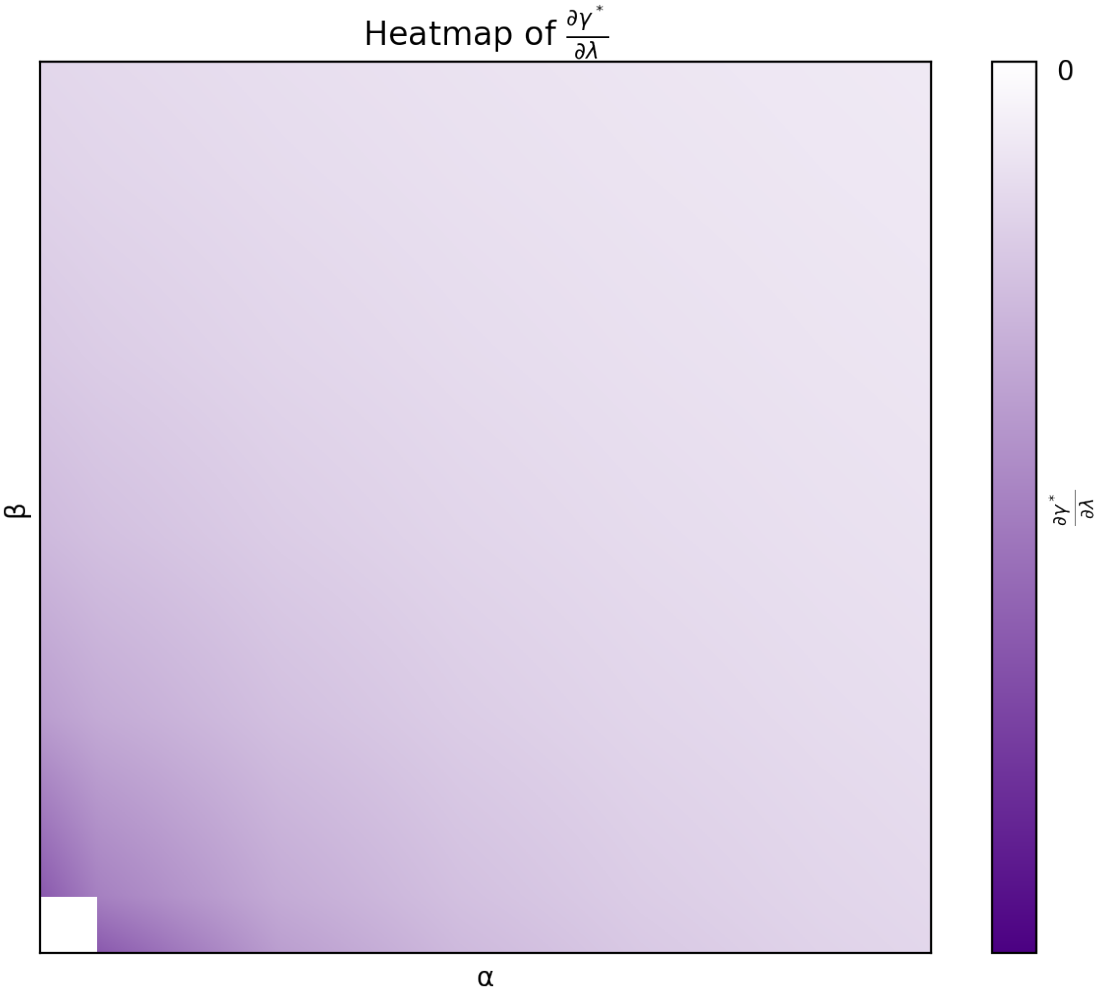
We can take the partial derivative of γ^* with respect to λ, and we obtain the following:

$$\frac{\partial \gamma^*}{\partial \lambda} = \frac{-1}{2(\alpha + \beta)}$$

It is crucial to note that the value of $\frac{\partial \gamma^*}{\partial \lambda}$ is always negative. In other words, for all scenarios where $a + b > 0$[10], the derivative of λ on γ^* is negative, indicating that an increase in λ will always result in a decrease in γ^*. This logically holds; we would expect that as a response became costlier, a state would be incentivized to respond less. This in and of itself is a significant result, but becomes much more important in later making claims about regime supremacy given a cost structure. We can visualize this relationship using a heatmap of λ, α, and β, as shown in Figure 5.

[10]Part of the theoretical foundation of this model is that a state is *always* a little bit accountable and is *always* motivated at least a bit to achieve a positive policy end. Therefore, we can discard any scenario where $(\alpha, \beta) = (0, 0)$, which allows us to assert the universality of $\frac{\partial \gamma^*}{\partial \lambda} < 0$.

Figure 5:


Heatmap of $\frac{\partial \gamma^*}{\partial \lambda}$
β
α
0
$\frac{\partial \gamma^*}{\partial \lambda}$

This holds intuitively - as either parameter becomes greater, γ^* becomes less responsive to λ because it is comparably less impactful than α or β. It further demonstrates that the partial derivative is symmetrically affected by α and β.

4.4 Modifying Crisis Severity

Proposition 2: An increase in β will always result in an increase in γ^* when $\bar{x} \geq x_c$ or when $0 < \gamma^* < \bar{x}$.

Having examined the linear $\lambda\gamma$ cost term, we can now begin to analyze the quadratic-term parameters and their impact on the state's best response. First, we take the partial derivative of γ^* with respect to β, reflecting the impact of a crisis' severity on the equilibrium:

$$\frac{\partial \gamma^*}{\partial \beta} = \frac{2\bar{x}\alpha - 2x_c\alpha + \lambda}{2(\alpha + \beta)^2}$$

We can see that $\frac{\partial \gamma^*}{\partial \beta} > 0$ when$2\bar{x}\alpha - 2x_c\alpha + \lambda > 0$, and vice versa. Further algebra can lend us the expression $\lambda < 2\alpha(\bar{x} - x_c)$ as a test of whether $\frac{\partial \gamma^*}{\partial \beta} > 0$ holds. Intuitively, this makes sense. Setting $\lambda = 0$ for a moment (and holding the hypothetical no-cost response), we can see that if $\bar{x} > x_c$, a stronger value of β will always pull γ^* towards $\bar{x}$. This leads us into Lemma 2:

Lemma 2: For all circumstances where $\bar{x} > x_c$, the non-zero value of λ means that $\gamma^* < \bar{x}$ must always be true. There exists no influence pulling the equilibrium towards a point higher than $\bar{x}$, and for all values of $\bar{x} > 0$, there exists at least one influence (λ) pulling the equilibrium towards zero.

If we change λ back to a nonzero value, then by Lemma 2, we know that so long as $\bar{x} > x_c$, it must be true that $\gamma^* < \bar{x}$, and since $\gamma^* < \bar{x}$, any increase in β must result in an increase in γ^* and vice versa. If $\bar{x} \leq x_c$, however, the sign of the partial derivative is

dependent on where γ^* falls given $\bar{x}$. If $\gamma^* < \bar{x}$, then an increase in β would still result in an increase in γ^*, and therefore the derivative is positive. However, if $\gamma^* > \bar{x}$, then an increase in β would result in a decrease of γ^*. We can intuitively see here that if $\gamma^* = \bar{x}$, then $\frac{\partial \gamma^*}{\partial \beta} = 0$, since strengthening β would only pull γ^* towards $\bar{x}$ and they are already equivalent. This circumstance is much more important in later sections discussing the alteration of α, as β is outside of the control of the state.

4.4.1 Scenario: A Rainstorm

We can further visualize this by graphing $c(\gamma)$ and evaluating the change in the best response γ^* as β is manipulated. I present below an extended hypothetical to demonstrate this parameter.

Let us imagine a rainstorm approaching. In this hypothetical, the severity of the rainstorm will be the manipulated variable and will be encapsulated by β. For any rainstorm, there are risks involved. Wind and lightning could damage buildings or cause loss of life, as could flooding and even storm surges in tropical cyclones. Rebuilding or repairing is expensive; rescue is incredibly costly in many ways. It is therefore always important to have some form of policy response for an approaching rainstorm.

There are many long-term preparatory policies that can mitigate this risk - proper education, storm-resistant construction, and alert systems. There are also many short-term preparatory policies that can minimize the impacts - travel restrictions, evacuations, and the like. For consistency, let us assume that because the rainstorm is approaching, we can no longer manipulate effectively the long-term policies in time for this particular event, and can only pull our short-term levers. This is the critical reflection of our definition of a crisis - that the parameters cannot be changed, and there is not advance notice for long-term preparatory policies within the scope of this model. Given these short-term levers, there is one degree of response that we can claim as most effective in mitigating all loss of life and

personal damage: evacuations. By totally evacuating a reasonable region, we can ensure that there will be no one present for the rainstorm to harm or kill. And, because our hypothetical world is perfect, we lastly assume that even though there may be some loss of life due to the evacuation itself (crashes, hospital evacuations, etc.), this total evacuation is still the best policy and is therefore the state of the world: $\bar{x}$. Thus, the domain of x represents the severity with which evacuations are facilitated or enforced.

As with most crises, such storms produce nonzero values of x_c and λ. The citizenry would want some form of a response from the government, be it small or large, as to do nothing would be to irresponsibly approach the crisis. However, we can note that as an aggregate, we would expect $x_c < \bar{x}$ to hold. Some citizens would not want to take sufficient measures to avoid loss from the storm. Storms are a phenomenal example of this pattern - no matter the severity of an incoming storm, there is invariably some degree of the population that chooses to defy evacuation orders for a myriad of reasons.[11] We further expect that few, if any, would voluntarily want $\gamma > \bar{x}$, as this would require an over-the-top investment, severe restrictions, and an objectively unnecessary cost beyond a known best policy. Furthermore, we can easily see that $\lambda > 0$ is true here; it is costly for the government to open shelters, change traffic patterns, provide additional services, or enforce/facilitate evacuations, not to mention the costs incurred by citizens seeking to evacuate.

We have now established the following bounds on our parameters for this hypothetical: $0 < x_c < \bar{x}$, $\lambda > 0$, $\alpha > 0$, and $\beta > 0$. Manipulating only the β value, we can see four general outcomes possible that are represented through this model.

Moderate-severity crisis: A Normal Tradeoff

First, let us examine a scenario wherein the value of β and α are equal.

[11] Carefully, I do not make a normative claim about this choice in this paper. Some people prefer not to evacuate because of plain stubbornness, but for many there is a genuinely motivating factor. Perhaps there are pets they cannot leave behind, they cannot afford the travel and have nowhere to go, their home is of significant family value and they feel it would be wrong to leave, etc. The point is not that these individuals are incorrect; rather, it is just that they are preferring a response slightly less than $\bar{x}$.

Figure 6:

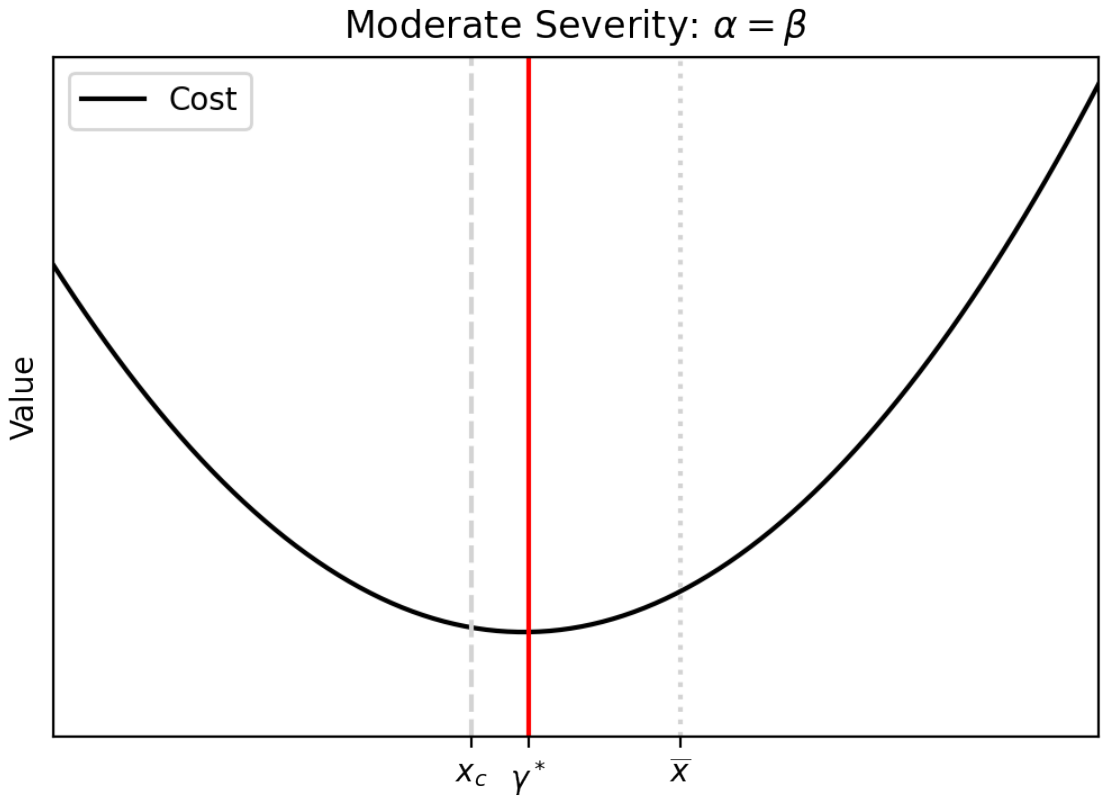

Moderate Severity: $\alpha = \beta$
Cost
Value
x_c
γ^*
$\overline{x}$

Figure 6 demonstrates equivalent values of α and β, indicating that the state is equally motivated by incentives of accountability and altruism with a non-zero response cost. Note that, since $\gamma^* = \frac{-\lambda+2\beta\bar{x}+2\alpha x_c}{2(\alpha+\beta)}$, $\gamma^*|_{\alpha=\beta}$ is equivalent for all values of $\alpha = \beta$. Thus, a situation such as the one portrayed here could manifest in circumstances where α and β are either incredibly high (∞) or incredibly low (0). However, more pragmatically, this would occur when the severity of the crisis and the degree of state accountability were comparable and moderate. (Note that this scenario is purely hypothetical and not particularly useful - since the state cannot change β, such a crisis would happen simply by chance and holds no additional significance over any other similar values of either α or β.

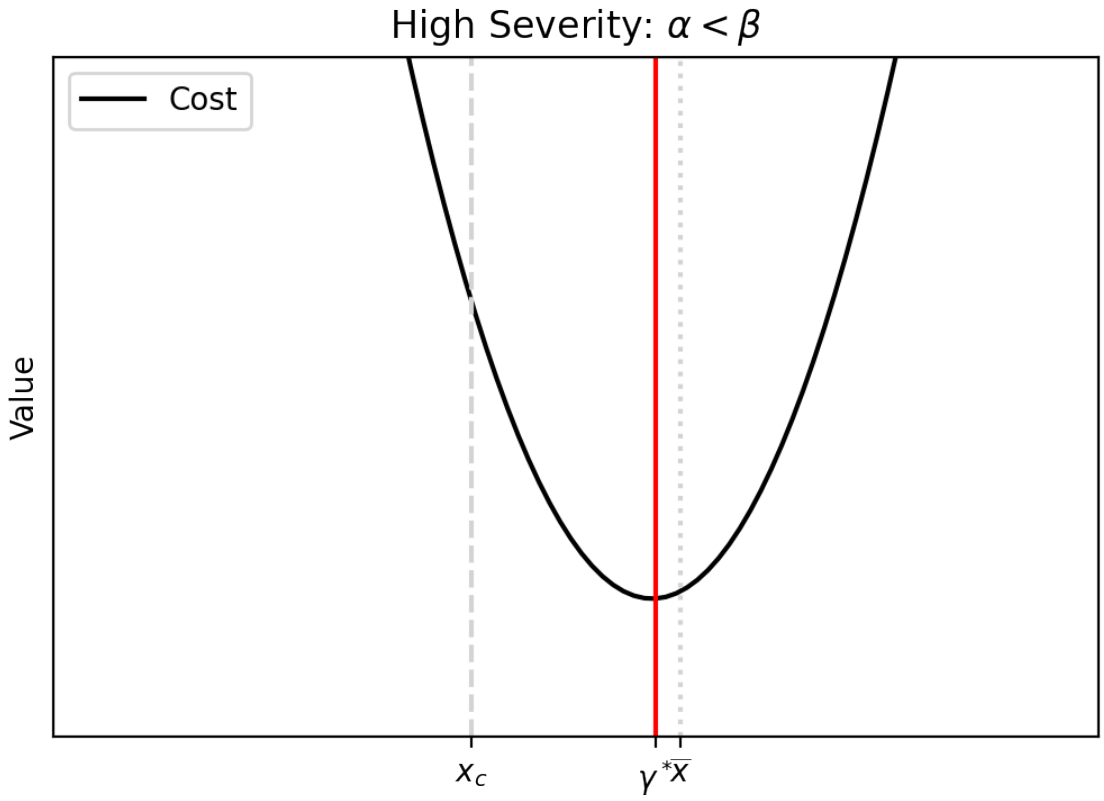
We might consider a scenario like this to be reflective of an incoming low-to-middle-category hurricane or similarly strong storm. The hypothetical crisis is neither meaningless nor totally catastrophic - while the state is motivated by a need to address the crisis, it is not so critical that the diverging preference of the citizenry can be discarded. The state-of-the-world policy is evacuations, which in this circumstance, could be potentially warranted. A failure to enact total evacuation could be met with some loss of life, but the outcome would not be the worst situation imaginable. However, as mentioned previously, we hold that $x_c < \bar{x}$, and the citizenry as a whole would want a weaker enforcement of evacuations. The state is then influenced by our three factors: the accountability cost and the responsive cost pushing γ^* down, and the altruistic cost pulling γ^* up. Our end result is γ^* situated slightly below the midpoint of x_c and $\bar{x}$, proportionate to the value of λ.

High-severity crisis: A Catastrophic Scenario

Second, let us examine a scenario wherein β is much greater than α, signifying a very severe crisis.

Figure 7 demonstrates a scenario wherein it is much more important to respond appropriately to the crisis than it is to respond in line with the citizenry. In theory, this could reflect simply the normal nature of a low-accountability state. But for now, let us conceptualize

Figure 7:



this as simply a very severe crisis, for example, a major hurricane imminently approaching. Even though the citizenry's aggregated desire is still less than $\bar{x}$, the immense penalty of inappropriately responding to the crisis pulls γ^* closer to $\bar{x}$ than in other circumstances. Note, however, that $\gamma^* \neq \bar{x}$, and would essentially never do so in a pragmatic circumstance. The state's ideal policy is to enforce evacuations more strictly than in the prior game with a less-severe hurricane. However, to enforce evacuations at gunpoint would, assuming the citizenry does not support this method[12], be too strict, pull γ^* too far away from α, and cause great dissent from the citizenry. The result can be seen in how evacuations are now largely handled for severe hurricanes: "mandatory evacuations" are instituted, where blatant noncompliers could theoretically be fined, but the primary method of enactment is the ceasing of normal emergency services throughout the course of the crisis. The evacuation is facilitated and enforced, but still enforced *intentionally* imperfectly.

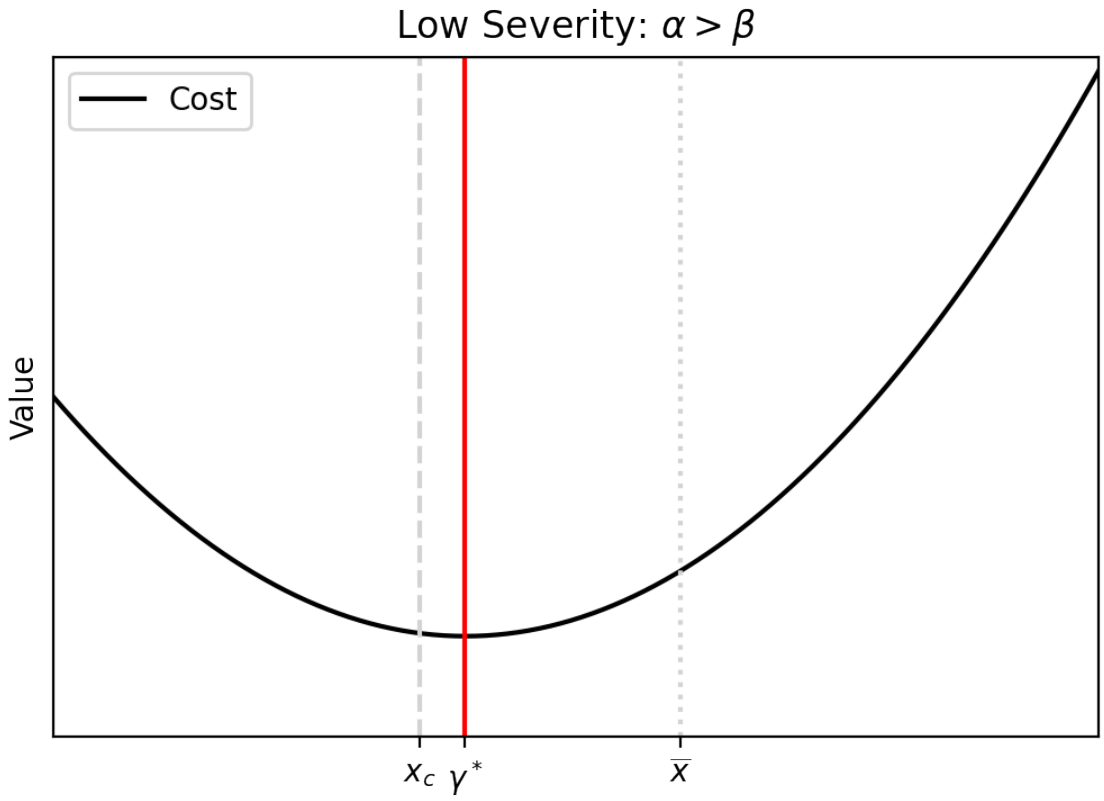
Low-severity crisis: Weathering The Storm

Third, let us examine a scenario wherein β is somewhat less than α, signifying a less-severe crisis where the state is still subjected to an altruistic motivation but is more significantly motivated by political and responsive costs.

Figure 8 demonstrates a scenario where it is not wholly unimportant to respond to the crisis, but it is less important to respond to the crisis than it is to align with the will of the citizenry. We can conceptualize this as a normal severe thunderstorm; there is not an inherent need for evacuations, although there could be some localized damage and even a probability of loss of life (though this would change from an expectation into a possibility). Therefore, even though evacuating an area (assuming it is possible to do so) would ensure that there is no injury or loss of life directly from the storm, it is less important that perfection in this response is achieved than it would be in a hurricane or catastrophic situation. Furthermore, the citizenry would by and large not want to evacuate or relocate - even knowing that evacuation is the *only* way to ensure with certainty that the storm will not harm them,

[12] A fair assumption.

Figure 8:



most will not think that it is worth it to do so. Just as in all of our cases, evacuation is costly to the state to implement as well. So, we end with a γ^* that is much closer to the citizenry's ideal point and further from $\bar{x}$, reflective of the less-severe crisis and therefore a lower value of β. In this case, a response might entail voluntary evacuation or temporary shelter resources for citizens in particularly vulnerable locations, but nothing more.

Note that in this case, we still construct $\gamma^* \geq x_c$. This leaves one final circumstance, wherein β is sufficiently strong such that $\gamma^* < x_c$. Though the ordinality of these parameters - $\alpha > \beta$ - is equivalent in both scenarios, we will later see the importance of this threshold $\gamma^* = x_c$.

Very-low-severity crisis: Passing By

Lastly, let us examine a scenario wherein β is much less than α such that $\gamma^* < x_c$. This signifies a very-low-severity crisis wherein there is really not much of an altruistic need for the state to respond, so much so that the citizenry would want an even stronger response than the best response of the state would imply.

Figure 9 depicts a scenario wherein β is so low that the primary influencing factors become α and λ. Note that, as β becomes negligibly small (or at least, much smaller than α), the actual location of γ^* is primarily determined by the relationship between α and λ. In this circumstance, it is so unimportant to respond perfectly to the crisis - the crisis is so far from severe - that the best response shifts very far away from $\bar{x}$. In this case, the cost of the response itself pulls γ^* below even the will of the citizenry, meaning that the best response of the state is lower than either the state of the world or the people's preference. We can conceptualize this as an afternoon rain shower. In this model, the only way to ensure that there is no injury or loss of life from any storm is, again, to totally evacuate. However, a light shower is very unlikely to cause any such harm or death; the citizenry would not want evacuations to be the response (hence $x_c < \bar{x}$), and the cost of implementing evacuations would be tremendously high. Therefore, though the citizenry might prefer to be provided

Figure 9:


Very Low Severity: $\alpha \gg \beta$
Cost
Value
γ^*
x_c
$\overline{x}$

personal umbrellas - a costly policy - the practical implementation of γ^* might entail letting citizens loiter in the city hall lobby until the sky clears if they please - a very non-serious interpretation of evacuation.

This scenario invites two important discussions. First, at the point where γ^* shifts below x_c given that $\bar{x} \geq x_c$, an important threshold is identified: namely, when $x_c \leq \gamma^* \leq \bar{x}$, a more-accountable state is pulled further from $\bar{x}$; however, when $\gamma^* < x_c \leq \bar{x}$, a more-accountable state is pulled closer to $\bar{x}$. Second, there exists a reference to our corner solution from Section 4.1 that is particularly relevant in our very-low-severity scenario: at some point, the best response of the state becomes $\gamma^* = 0$, and total inaction is the optimal policy.

4.5 Modifying Accountability & Regime Type

At its core, this paper asks: under what circumstances do democratic or authoritarian states enact more-appropriate crisis response policies? Section 3 of this thesis describes the construction and process of this general model of responsive policy-making. Section 4.1 provides a general solution to the model, which is further bolstered by the limits described in Section 4.2. Sections 4.3 and 4.4 provide further framework for this solution, describing the model's functional application and analyzing how manipulating λ and β could produce expected - and, occasionally, unexpected - results.

This subsection focuses on the paper's primary conclusions. Namely, in it I identify boundaries of λ and β which would mark either an authoritarian or democratic system as being better-equipped to respond. As discussed in section 3.5, the normative goal and welfare analysis lens of this model is to identify the type of system which would play γ^* closest to $\bar{x}$. We continue to hold true the assumption that an authoritarian state is generally less accountable than a democratic state.

Given these considerations, the solution pathway is relatively straightforward: we must identify ranges within the model's parameters wherein a greater value of α shifts γ^* either

closer to or further from $\bar{x}$. In a more comprehensive sense, this entails two steps. First, we must take the partial derivative of γ^* with respect to α and identify when that expression is either positive or negative. A positive value of $\frac{\partial \gamma^*}{\partial \alpha}$ indicates that a more-accountable (democratic) state would play a greater value of γ^* than a less-accountable (authoritarian) state; a negative value of $\frac{\partial \gamma^*}{\partial \alpha}$ indicates that a more-accountable state would play a lesser value of γ^* than a less-accountable state; and a value of zero indicates that a regime of any type would provide an equivalent response. However, we are not solely dependent on a positive or negative relationship between γ^* and α. As a result, we must add our second step: comparing conditions when an increase in γ^* would move it towards $\bar{x}$, and conditions when the converse would be true.

Let us start by taking the partial derivative with respect to α. (Note the similarity between this partial derivative and $\frac{\partial \gamma^*}{\partial \beta}$, due to the symmetry of α and β in this expression.)

$$\frac{\partial \gamma^*}{\partial \alpha} = \frac{\lambda - 2\beta\bar{x} + 2\beta x_c}{2(\alpha + \beta)^2}$$

We then identify critical boundaries for this expression by identifying where the numerator equals zero.[13]

$$\text{Set } \lambda - 2\beta\bar{x} + 2\beta x_c = 0 \Rightarrow \lambda = 2\beta(\bar{x} - x_c)$$

$$\text{Therefore, } \frac{\partial \gamma^*}{\partial \alpha} = 0 \text{ when } \lambda = 2\beta(\bar{x} - x_c).$$

Because the denominator is always positive (since by definition, $(\alpha + \beta) \in \mathbb{R}$ and $\forall x \in \mathbb{R}, x^2 \geq 0$ and $(\alpha + \beta \neq 0)$, we can evaluate the sign of the derivative simply by evaluating whether the numerator is positive, negative, or zero. We have shown above where this is zero; therefore, we can easily deduct the following:

[13]Again, note that either α or β must be nonzero to avoid a divide-by-zero error, but we continue to assume that neither of these values can feasibly equal zero.

$$\frac{\partial \gamma^*}{\partial \alpha} = 0 \text{ when } \lambda = 2\beta(\bar{x} - x_c)$$

$$\frac{\partial \gamma^*}{\partial \alpha} > 0 \text{ when } \lambda > 2\beta(\bar{x} - x_c)$$

$$\frac{\partial \gamma^*}{\partial \alpha} < 0 \text{ when } \lambda < 2\beta(\bar{x} - x_c)$$

Now that we have the cardinal values of this derivative, we then turn to the second question in our solution process: when does an increase move γ^* closer to $\bar{x}$? We can approach this question logically. A democratic state will, all else held equal, enact a policy closer to x_c than an authoritarian state because of the stronger value of the accountability cost term, $\alpha(\gamma - x_c)^2$. As a result, a democratic state would enact a more socially efficient policy - closer to $\bar{x}$ - when $\bar{x}$ and x_c are in the same direction as each other from γ^*. Let us have some real set of parameters for our model. There then exist three possible arrangements: $x_c = \bar{x}$, $x_c < \bar{x}$, and $x_c > \bar{x}$. For each of these arrangements, γ^* can fall in one of two circumstances: either unilaterally above or below both x_c and $\bar{x}$[14], or in between x_c and $\bar{x}$.

I present two primary approaches to solving this model. First, I present a mathematical minimization approach that is both complete and rigorous, and allows us to categorize efficiency in its entirety. Second, I present a directional approach that is more conceptual and qualitative in nature, but further supports the mathematical minimizations by illustrating exactly how the relationships between our variables and parameters can be evaluated to determine which level of accountability - and thus, regime type - is most efficient for a given crisis.

[14]As we will soon prove, only unilaterally below is possible.

4.5.1 A Minimization Approach

It is possible - and, indeed, very intuitive - to solve this question logically, as the directional approach will demonstrate. However, a mathematical foundation can be supportive and even necessary for parts of this discussion. Thankfully, a clear approach is already written in this paper. In line with our normative analysis (section 3.5), we are primarily interested in identifying under what circumstances and premise of α is the best response closest to $\bar{x}$. We can therefore express the following equation which we will minimize with respect to α:

$$\gamma^* - \bar{x} = \frac{-\lambda + 2\alpha x_c + 2\beta\bar{x}}{2(\alpha+\beta)} - \bar{x}$$

$$\frac{\partial}{\partial\alpha} = \frac{\lambda - 2\beta\bar{x} + 2\beta x_c}{2(\alpha+\beta)^2}$$

Note that this is the same result as $\frac{\partial\gamma^*}{\partial\alpha}$. Just as we did with that expression, we can identify a critical point by setting the derivative equal to zero, which we accomplish through zeroing the numerator:

$$\lambda - 2\beta\bar{x} + 2\beta x_c = 0$$

$$\lambda = 2\beta(\bar{x} - x_c)$$

This provides a useful boundary, where if $\lambda > 2\beta(\bar{x} - x_c)$, then an increase in accountability shrinks $\gamma^* - \bar{x}$, and we can therefore claim democratic supremacy. Conversely, we can see that if $\lambda < 2\beta(\bar{x} - x_c)$, then an increase in accountability increases $\gamma^* - \bar{x}$, and we can therefore claim authoritarian supremacy. And, if $\lambda = 2\beta(\bar{x} - x_c)$, then we have regime indifference.

But, what if $x_c \geq \bar{x}$? We have set the condition $\lambda > 0$; if $x_c \geq \bar{x}$, then λ must be negative, which is not possible. This would occur in situations where the citizenry wanted

a more intense investment than the state. Such a circumstance is statedly possible, even though this current expression could not represent it. To solve for these circumstances, we must construct an equation for which a negative λ is not necessary. Fortunately, there exists a straightforward way to accomplish this. By squaring the distance function, we can still properly identify critical points, and we can account for only positive λs:

$$(\gamma^* - \bar{x})^2 = (\frac{-\lambda + 2\alpha x_c + 2\beta\bar{x}}{2(\alpha+\beta)} - \bar{x})^2$$

$$\frac{\partial}{\partial\alpha} = \frac{(\lambda + 2\alpha\bar{x} - 2\alpha x_c)(-\lambda + 2\beta\bar{x} - 2\beta x_c)}{2(\alpha+\beta)^3}$$

Because we hold both $\alpha > 0$ and $\beta > 0$, we can determine the sign of the derivative simply by the sign of the numerator. Since there are two terms in the numerator and we are evaluating the sign of their product, we can claim that if both terms are either positive or negative, then the derivative is positive. However, if only one term is positive and the other is negative, then the derivative is negative.

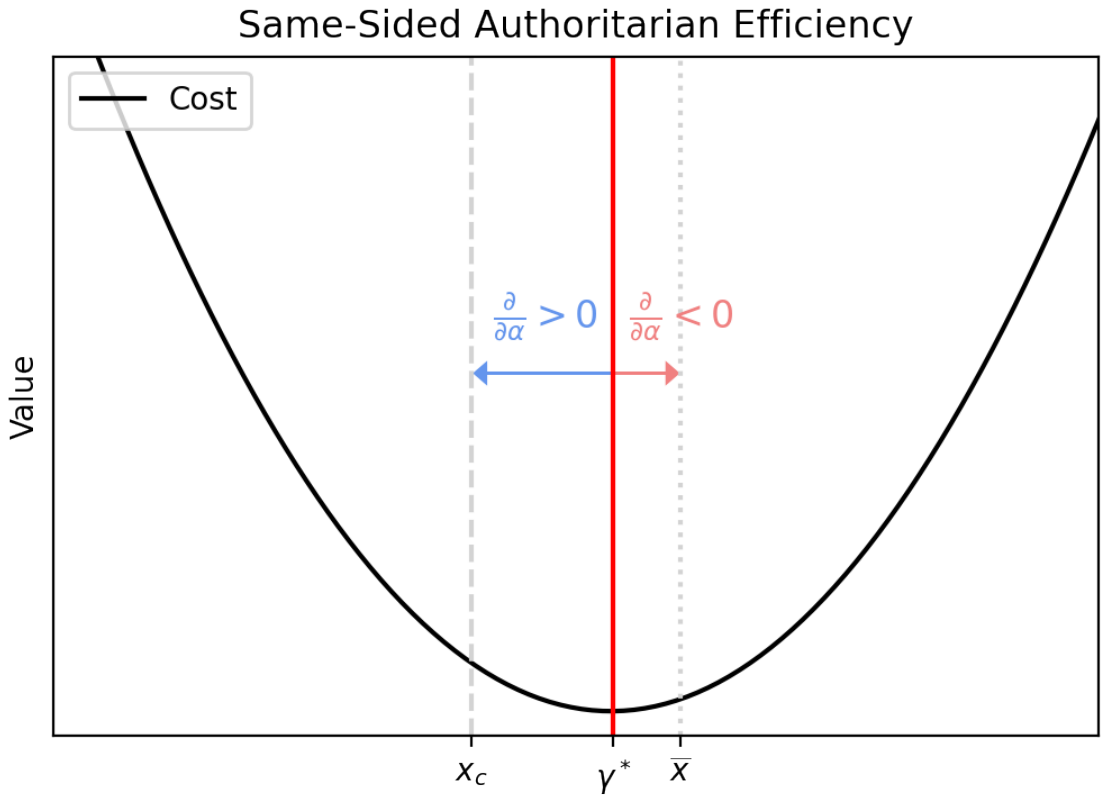
Note that the relationship between $\bar{x}$ and x_c is critical in this solution. If $\bar{x} > x_c$, then the term $\lambda + 2\alpha\bar{x} - 2\alpha x_c$ must be positive. Therefore, the solution lies in the sign of the second term: if $-\lambda + 2\beta\bar{x} - 2\beta x_c$ is positive, then the entire derivative is positive and there exists authoritarian efficiency. However, if $-\lambda + 2\beta\bar{x} - 2\beta x_c$ is negative, then the entire derivative is negative and there exists democratic efficiency. Note that this is the same test expression from the non-squared equation! Lastly, if $\bar{x} < x_c$, the solution pathway gets rather complex. I explore that soon.

4.5.2 A Directional Approach

The minimization approach is mathematically rigorous. However, a directional approach may prove more intuitive, and in particular explains the influence of λ in determining efficiency.

The central question of this section is as follows: when does an increase move γ^* closer to $\bar{x}$? The minimization approach allows us to identify the sign of a partial derivative to evaluate this. We can also, however, simply question a common thread: since an increase in α pulls γ^* towards x_c, when is x_c in the same direction from γ^* as $\bar{x}$? Rearranged, when γ^* and x_c are on the same side of $\bar{x}$, by Lemma 1, an increase in α will give a consistent answer - i.e., γ^* will approach but never cross past x_c, so there is a clear optimal direction. Figure 10 demonstrates a scenario wherein per the values of λ, β, and $\bar{x}$, γ^* falls in between $\bar{x}$ and x_c and thus γ^* and x_c are on the same side as each other from $\bar{x}$. In this case, x_c and $\bar{x}$ are in opposite directions from γ^*. As a result, an increase in α will move γ^* in the opposite direction as $\bar{x}$, indicating authoritarian efficiency.[15]

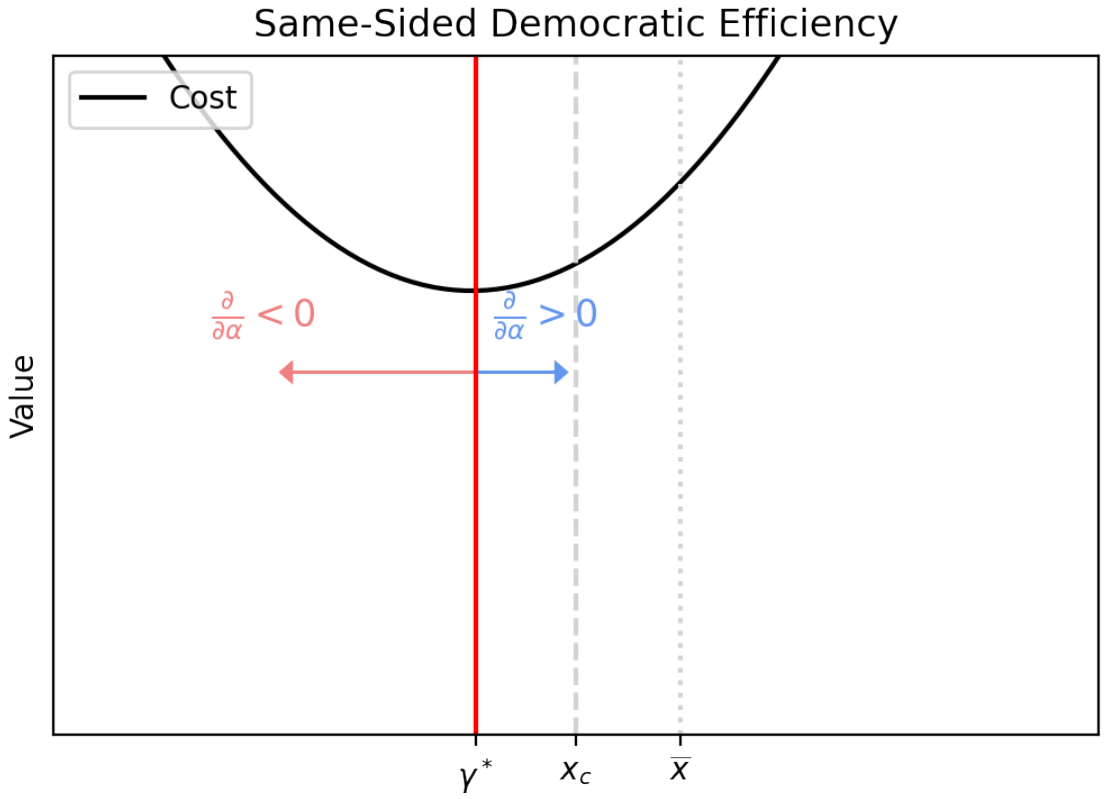
Figure 10:



[15]Note that the arrows in these directional diagrams are not necessarily intended to represent limits or actual magnitude so much as direction. For example, unless λ approaches 0 or β approaches ∞, γ^* would eventually hit an asymptote of $\gamma^* < \bar{x}$. Though the magnitude is not intentionally scaled, the direction is.

However, if λ increases sufficiently relative to β such that $\gamma^* < x_c$, then a circumstance exists wherein x_c and $\bar{x}$ are on the side side of γ^*. In this case, an increase in α moves γ^* towards both x_c and $\bar{x}$, indicating democratic efficiency. Figure 11 demonstrates this below, where any increase in α will move γ^* closer to $\bar{x}$.

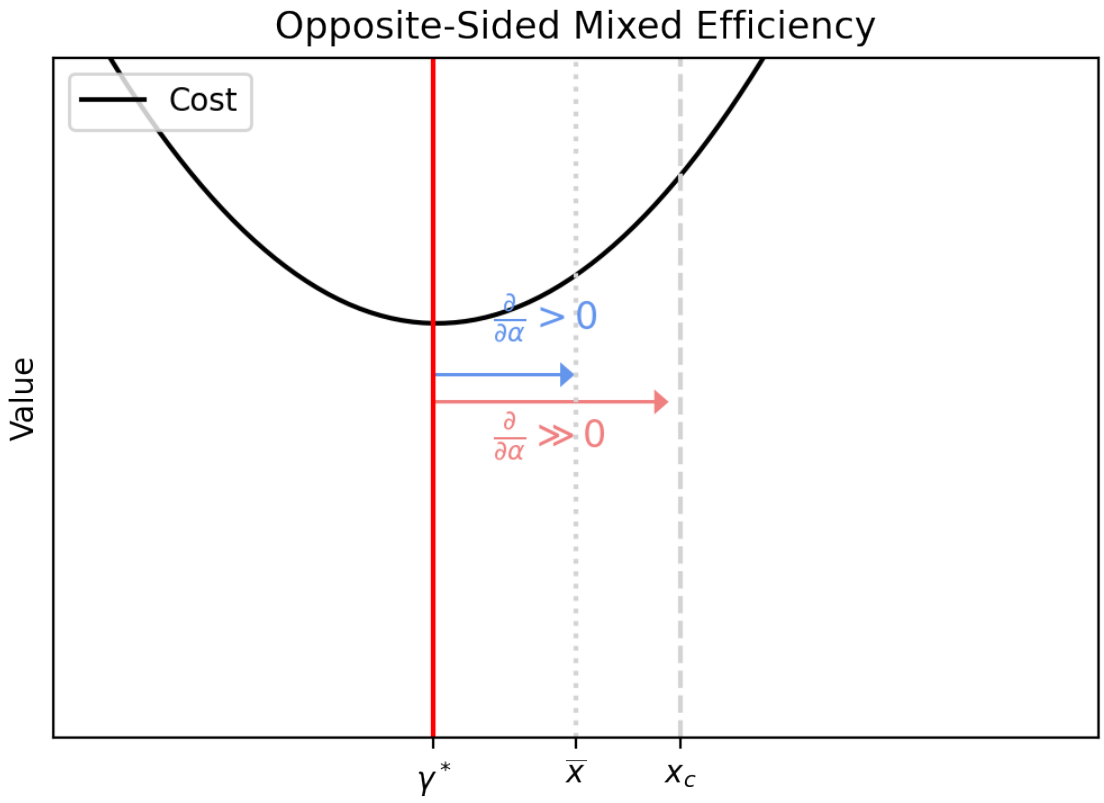
Figure 11:



But, what happens if γ^* and x_c are on opposite sides of $\bar{x}$? Then, an increase in α may initially move γ^* closer to $\bar{x}$, but once γ^* crosses past $\bar{x}$, this democratic efficiency changes to authoritarian efficiency. Figure 12 depicts this below, where there is not unilateral efficiency of either regime type but rather a range of efficiency. Therefore, there must exist some ideal value of α that would optimize $(\gamma^* - \bar{x})^2$.

These directional approaches are direct reflections of the minimization problem and help further conceptualize exactly how more or less accountability may move γ^* with regards

Figure 12:


Opposite-Sided Mixed Efficiency
Cost
Value
$\frac{\partial}{\partial \alpha} > 0$
$\frac{\partial}{\partial \alpha} \gg 0$
γ^*
$\overline{x}$
x_c

to $\bar{x}$. The following subsections will take a more in-depth approach towards each of these circumstances, explaining solution pathways based on both the minimization approach and the directional approach. I do not present every possible directional organization, as the minimization approach provides complete insights into regime efficiency; rather, I simply present in this subsection each of the primary mechanisms that may be in play as I transition into more specific solution fields.

4.5.3 Evaluating When $\bar{x} = x_c$

Note that when $\lambda = 2\beta(\bar{x} - x_c)$, we get $\frac{\partial}{\partial\alpha}(\frac{-\lambda+2\alpha x_c+2\beta\bar{x}}{2(\alpha+\beta)} - \bar{x})^2 = 0$. At this point, there is no impact of accountability on the best response; therefore, we would expect any state no matter the value of α to play the same value of γ^*.

4.5.4 Evaluating When $\bar{x} > x_c$

In this entire subsection, let us hold true that $\bar{x} > x_c$.

Let us continue this discussion first as if the condition $\lambda > 2\beta(\bar{x} - x_c)$ is met and thus the β term is positive. Then, $\frac{\partial}{\partial\alpha} > 0$ if and only if $\lambda + 2\alpha\bar{x} - 2\alpha x_c > 0$. If $-\lambda + 2\beta\bar{x} - 2\beta x_c > 0$ holds, then since $\beta > 0$ it must be true that $\bar{x} > x_c$. If $\bar{x} > x_c$, and $\lambda > 0$, then this α term must be positive as well, and thus the entire derivative is positive. Therefore, if $\lambda > 2\beta(\bar{x} - x_c)$, then $\frac{\partial}{\partial\alpha}(\gamma^* - \bar{x})^2 > 0$. As this indicates that an increase in accountability would increase the distance between γ^* and $\bar{x}$, we can claim **authoritarian supremacy** in this circumstance.

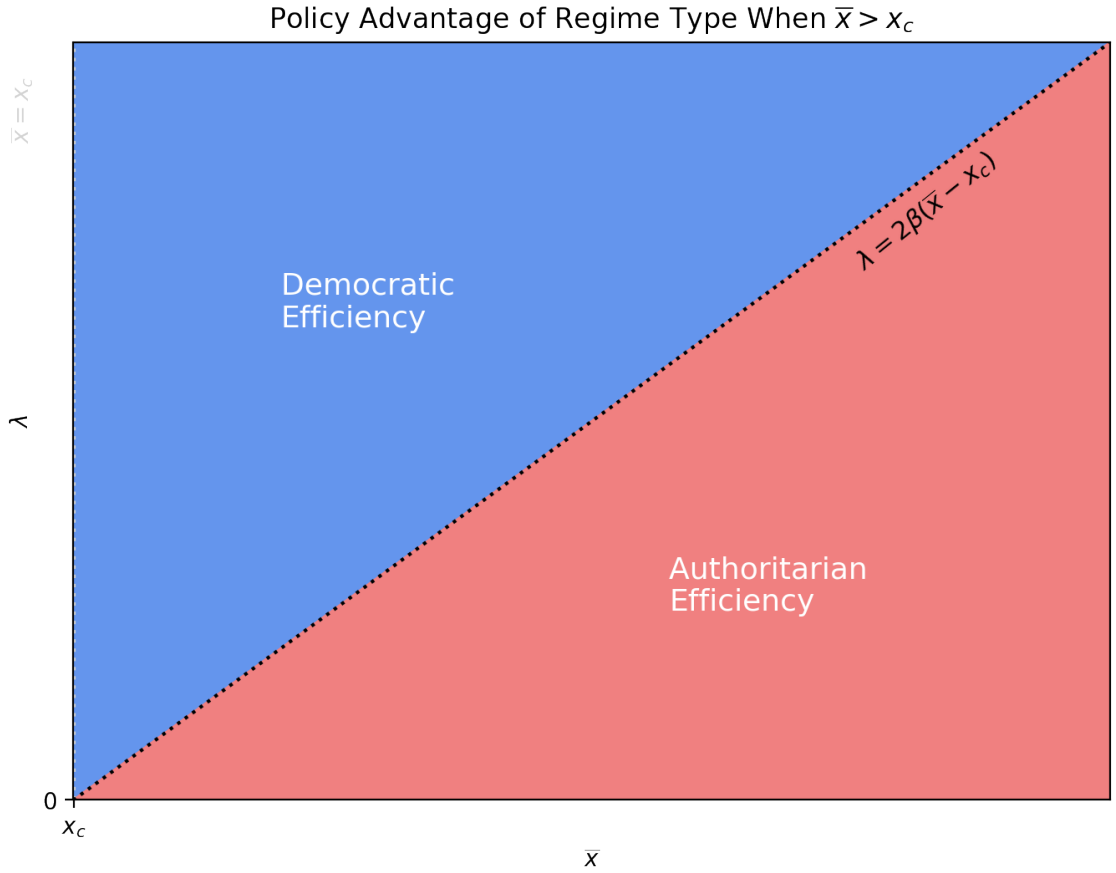
However, if $\lambda < 2\beta(\bar{x} - x_c)$, the situation becomes a bit more complex. In such a case, the second term is negative. We then evaluate the first term:

$$\lambda + 2\alpha\bar{x} - 2\alpha x_c > 0$$

$$\lambda > 2\alpha(x_c - \bar{x})$$

This leads to a bit of confusion, as α is both in the equation and in the derivative. Rather than employ a differential equation, however, we can apply some simple logic to shape this property. The α term is $\lambda + 2\alpha\bar{x} - 2\alpha x_c$. Since $\lambda > 0$, this term is strictly positive if $\bar{x} > x_c$. Therefore, if $\bar{x} > x_c$, then the value of the partial is positive if and only if $\lambda > 2\beta(\bar{x} - x_c)$, and we can declare **authoritarian supremacy** when this λ condition is met and **democratic supremacy** when this λ condition is not met. Figure 13 displays this region.

Figure 13:



By returning to - and expanding upon - our directional approach to regime efficiency, we can further outline the value of $\frac{\partial \gamma^*}{\partial \alpha}$. Namely, if γ^* and x_c are on identical sides of $\bar{x}$, we can

then prove that **democratic supremacy** exists. In this case - so, either $\gamma^* < x_c \leq \bar{x}$ or $\bar{x} < x_c \geq \gamma^*$ - a democratic state will pull γ^* closer to the value of $\bar{x}$ than an authoritarian state, since x_c will always be in the same direction from γ^* as $\bar{x}$. However, because γ^* does not pass $\bar{x}$ in its approach towards x_c as α increases, a stronger α will always pull γ^* closer towards $\bar{x}$. Recall from Lemma 1:

$$\lim_{\alpha \to \infty} \gamma^* = \lim_{\alpha \to \infty} \frac{-\lambda + 2\beta\bar{x} + 2\alpha x_c}{2(\alpha + \beta)} = x_c$$

Therefore, an increase in α in this case will always pull γ^* towards $\bar{x}$ because it is in the same direction as x_c, but by $\lim_{\alpha \to \infty} c(\gamma^*)$, we can see that it will never cross past $\bar{x}$. We can further evaluate that the expression represented by $|\gamma^* - \bar{x}|$ as a function of α is strictly decreasing and convex with an asymptote of $|x_c - \bar{x}|$.[16] Therefore, we can label any circumstance where γ^* is on the same side of $\bar{x}$ as x_c given that $\bar{x} > x_c$ as **democratic supremacy.** This relationship is fairly obvious. Recalling our expression $\frac{\partial \gamma^*}{\partial \alpha} = 0$ when $\lambda = 2\beta(\bar{x} - x_c)$, we can generally expect this same-sided situation to occur when λ is relatively very high and so γ^* is shifted below both $\bar{x}$ and x_c.

Incidentally, we can actually gleam from this reasoning a further conclusion about crisis response:

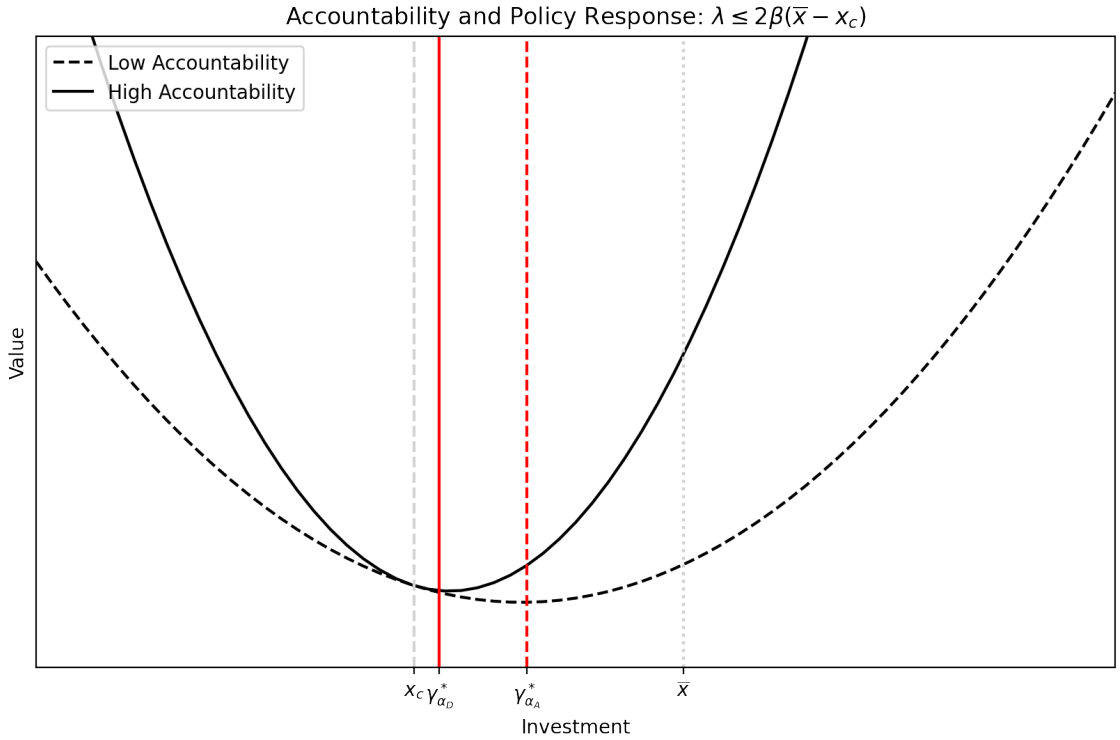
Proposition 3: For all values of the given parameters, γ^* must be less than either $\bar{x}$ or x_c. Because the state incurs a cost as it moves further from $\bar{x}$ and x_c, the best response of a no-cost scenario becomes the average of $\bar{x}$ and x_c weighted by β and α. Let $\hat{\gamma}$ represent this weighted average. By definition, either $\bar{x} \leq \hat{\gamma} \leq x_c$ or $x_c \leq \hat{\gamma} \leq \bar{x}$. Furthermore, we know that $\lambda > 0$ by definition, so $\gamma^* < \hat{\gamma}$.. Therefore, for any values, it must be true that either $\gamma^* < \bar{x}$ or $\gamma^* < x_c$ or both.

We can further explore this relationship intuitively. Given that $\bar{x} \geq x_c$ and $\lambda > 0$, we

[16] This last point allows us to prove the following: if $\bar{x} = x_c$, this "same-side" reasoning still holds. The value of $\lim_{\alpha \to \infty} c(\gamma^*)$ is simply $x_c = \bar{x}$, and the asymptotic limit of $|x_c - \bar{x}|$ is 0.

know that $\gamma^* < x_c$ for all parameter values. Therefore, one of two conditions must be true: either $\gamma^*|\alpha = 0$ and falls between x_c and $\bar{x}$, or below both of them. If λ is sufficiently strong such that $\gamma^*|\alpha = 0 < x_c$ (which occurs when the condition $\lambda > 2\beta(\bar{x} - x_c)$ is true), then a higher value of α pulling γ^* towards x_c would also be pulling γ^* closer towards $\bar{x}$. However, if λ is not incredibly strong - or, perhaps, if β is very strong, or if $\bar{x} - x_c$ is very large - then $\gamma^*|\alpha = 0$ falls between x_c and $\bar{x}$. Then, an increase in α pulling γ^* closer towards x_c would pull it further from $\bar{x}$. Figure 14 depicts this balance in practice. Note that it is conceptually identical to Figure 10, and simply displays γ^* for a higher and lower value of α where $\alpha_{Authoritarian} < \alpha_{Democratic}$:

Figure 14:



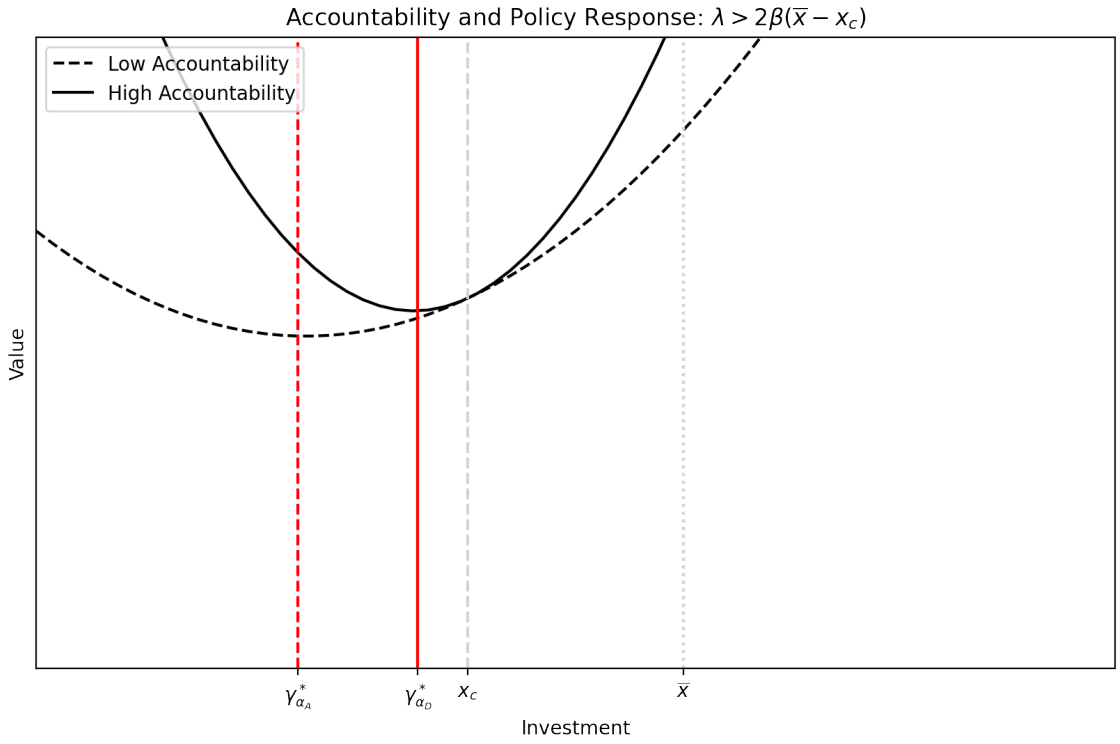
Let us consider a couple of brief hypothetical scenarios to explore this case. First, we can turn towards a pandemic scenario wherein we would expect the will of the populace to fall to a less-intense response than would be necessary to absolutely eradicate any loss. If the cost of a response is fairly low in comparison to either the social planner's policy's

position or the importance of an accurate response, the state would be first incentivized to enact a response strategy closer to the state of the world, and any stronger influence of the will of the people would deliver a progressively less-effective response. Therefore, we might expect an authoritarian state to be less responsive to this desire of the citizenry to enact an inadequate response than a democracy would be, and therefore would play a more-effective best response. The result, then, is a region of authoritarian efficiency. If the response is not so tremendously costly such that the state's first preference would be to respond even below the citizenry's ideal point, an authoritarian state would overcome this inadequate desire by the citizenry. In a case such as a pandemic, this might entail mask mandates - a policy theoretically necessary to solve the crisis, not universally accepted by the citizenry, but not so costly such that the state would rather not enact or enforce it.

However, it is not always the case that an authoritarian state would be best at responding when the will of the citizenry is for a weaker response than is ideal. Particularly as we might consider situations where $x_c < \bar{x}$ to represent collective action problems wherein there is a free-riding incentive (and thus, the citizenry in aggregate would prefer to face a less-severe personal response), it is empirically frivolous to claim that authoritarian states would always enact a better policy under these circumstances. Any insight regarding policy-making and crises in authoritarian states quickly disproves the notion that the centralized state can always overcome problems of collective action. Rather, when the high cost of responding to a crisis would otherwise disincentivize a state from responding appropriately, a democratic state may be best-equipped. Figure 15 displays this scenario. Note that it is conceptually identical to Figure 11, and simply displays γ^* for a higher and lower value of α:

In such a case, we might expect that because the will of the citizenry is still above the state's response even though it is below the state of the world, a more-accountable state would pull the policy still closer to the best policy than a less-accountable state. This might occur in a case such as creating school or commercial lockdowns in response to a pandemic.

Figure 15:



Though the citizenry almost certainly does not want in aggregate the perfect response that would be needed to eradicate the disease - i.e., strictly enforced total lockdowns - the cost to the state of enforcing such policies may be significant. There could be a higher welfare burden, a significant devotion of resources to virtual learning, commerce, or administration, and many other costs which the state would hope to avoid altogether. In this case, an authoritarian state may be able to weather both a politically insufficient response, while a democratic state would be more incentivized to perform closer to the will of the people and thus enact a more effective policy.

4.5.5 Evaluating When $\bar{x} < x_c$

In this entire subsection, let us hold true that $\bar{x} < x_c$.

We have now established completely democratic and authoritarian supremacy conditions

where $\bar{x} > x_c$. However, what about when this is not true? Let us return to our distance partial derivative from earlier:

$$\frac{\partial}{\partial \alpha} = \frac{(\lambda + 2\alpha\bar{x} - 2\alpha x_c)(-\lambda + 2\beta\bar{x} - 2\beta x_c)}{2(\alpha + \beta)^3}$$

When $\bar{x} > x_c$ was true, we could easily determine that the first term must be positive and therefore the sign of the derivative was wholly tied to the value of $2\beta(\bar{x} - x_c)$ in comparison with λ. Unfortunately, when the $x_c > \bar{x}$, the sign of the first term is not a given and therefore this solution becomes somewhat more involved. Let us first derive an expression for the first term, which if met renders the first term positive:

$$\lambda + 2\alpha\bar{x} - 2\alpha x_c > 0$$

$$\lambda > 2\alpha(x_c - \bar{x})$$

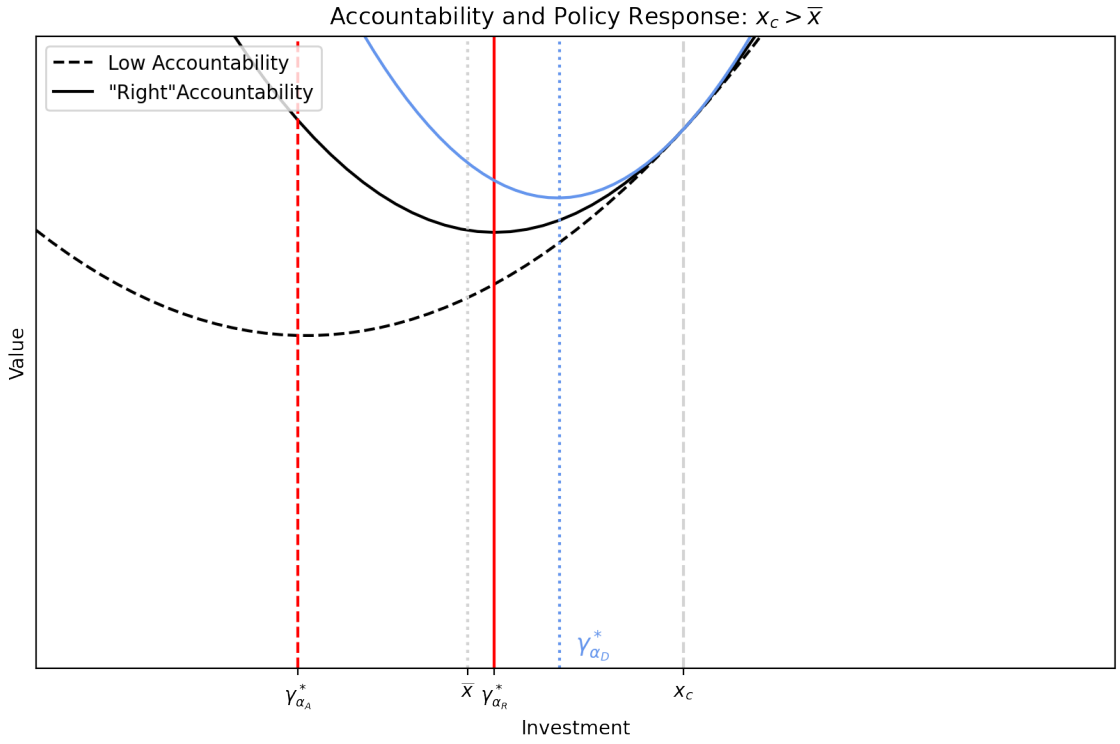
Already, we can see that this is going to invite a different solution pathway. Our condition involves α itself. Intuitively, however, it is fairly simple to comprehend how we got to this situation. If $\bar{x} < x_c$, then the value of $\gamma^*|\alpha$ can exist either below or above $\bar{x}$. In such a case, if $\gamma^* < \bar{x}$, then an increase in α will pull γ^* closer to $\bar{x}$ ***until such point as*** γ^* ***passes*** $\bar{x}$, beyond which, an increase in alpha will pull γ^* further from $\bar{x}$. Recall Lemma 1:

$$\lim_{\alpha \to \infty} \gamma^* = \lim_{\alpha \to \infty} \frac{-\lambda + 2\beta\bar{x} + 2\alpha x_c}{2(\alpha + \beta)} = x_c$$

When $x_c < \bar{x}$, this lemma allowed for a straightforward analysis where γ would always move either closer to or further from $\bar{x}$ as α either increased or decreased. This, fortunately, allowed us to construct the ideal value of $\frac{\partial}{\partial \alpha}$ as a binary choice between either 0 or ∞. Now, however, γ^* is able to pass freely past $\bar{x}$, meaning that there exists some given value α^* wherein given values of β, $\bar{x}$, x_c, and λ, policy efficiency is not given by a state being either

high-accountability or low-accountability, but rather, "right-accountability." We can see this in Figure 16, which takes the same directional approach from earlier and depicts a too-low, too-high, and almost-right iteration of accountability.

Figure 16:



In any case, let us return to the expression of $\frac{\partial}{\partial \alpha}$. Because $\bar{x} < x_c$, we can quickly see that the second term of the numerator is strictly negative. Therefore, we can see that an increase in α moves γ^* closer to $\bar{x}$ only when the first term is positive and therefore $\lambda > 2\alpha(x_c - \bar{x})$, and thus we would claim democratic efficiency. If $\lambda > 2\alpha(x_c - \bar{x})$, then the first term is negative, and the entire derivative is positive; therefore, democratic efficiency exists. We therefore create a gradient series of indifference curves, recognizing not a straightforward condition of "democratic efficiency" or "authoritarian efficiency" but rather an ideal, maximally-efficient value of α as α^*. Since the domain of α is fairly arbitrary - one cannot reasonably say under this model that $\alpha = 5$ is a democracy, only that $\alpha = 5$ is more democratic than $\alpha = 4$ - this can intuitively be applied mostly through simple comparative statics. We can solve for the

following:

$$\alpha = \alpha^* \text{ when } \frac{(\lambda + 2\alpha\bar{x} - 2\alpha x_c)(-\lambda + 2\beta\bar{x} - 2\beta x_c)}{2(\alpha+\beta)^3} = 0$$

$$\alpha = \alpha^* \text{ when } \lambda = 2\alpha(x_c - \bar{x})$$

$$\alpha^* = \frac{\lambda}{2(x_c - \bar{x})}$$

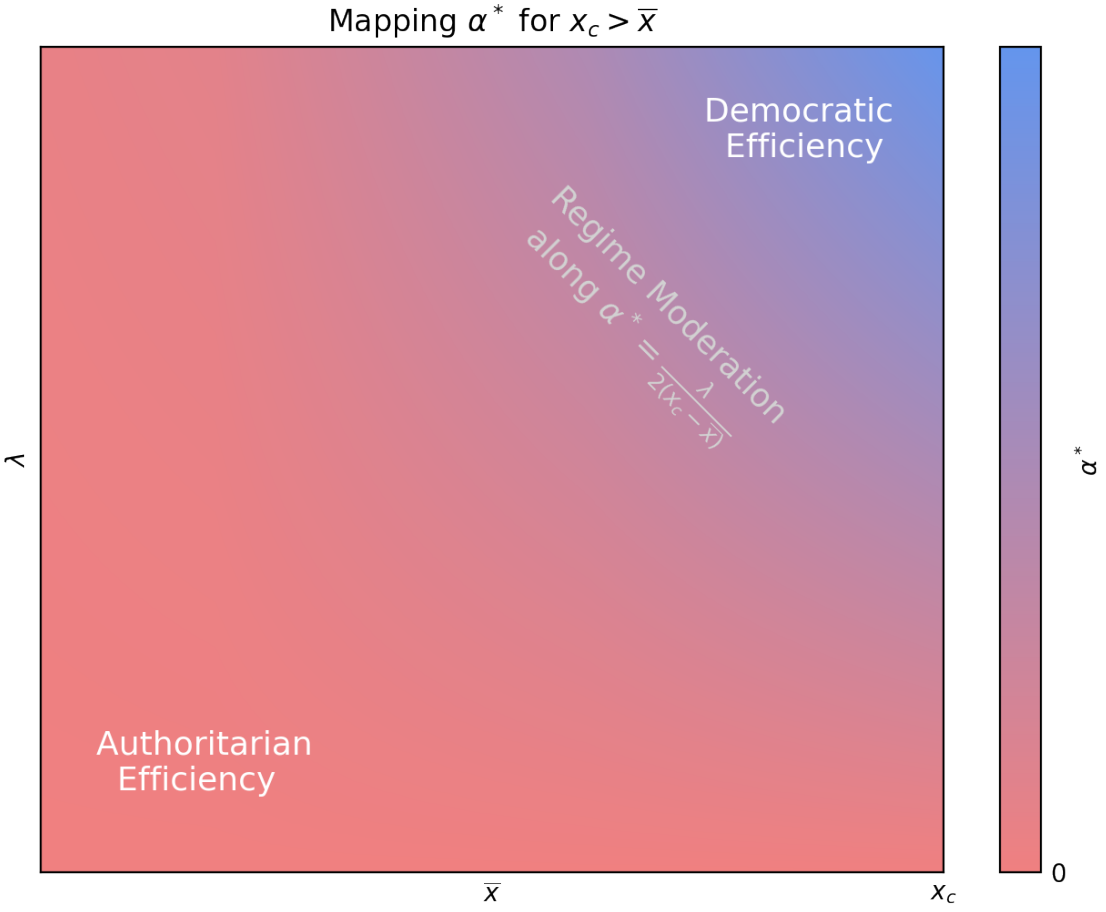
We now have a multivariate function describing the impacts of λ, $\bar{x}$, and x_c on α. Figure 17 shows a heat map of this relationship. Notice the gradient between the bottom-left and top-right corners. In the top-right corner, the high cost of a response and the reasonable desires of the citizenry lead to a more accountable state being best-equipped to respond appropriately. However, as either the cost of a response decreases, or the citizenry's preference becomes further from the actual state of the world - or both - a more accountable state, facing greater pressure to reflect the will of the people even if incorrectly, will respond less appropriately than a less-democratic one. Note that the gradient coloring, though appropriately reflective of our function for α^*, is not entirely readable by scale. Rather, this depiction should primarily be used to evaluate the general direction of accountability as these parameters change.

4.5.6 Applications to the Fukushima & Chernobyl Nuclear Disasters

The International Atomic Energy Agency (IAEA) recognizes two events as being Level 7 events - "major accidents," the most serious - on their INES incident scale. Such events constitute significant releases or exposure of radioactive material and cause substantial harm to the environment and individuals.

The first such event was the Chernobyl disaster in Chernobyl, USSR. On April 26, 1986,

Figure 17:


Mapping α^* for $x_c > \overline{x}$
Democratic Efficiency
Regime Moderation along $\alpha^* = \frac{\lambda}{2(x_c - \overline{x})}$
Authoritarian Efficiency
λ
$\overline{x}$
x_c
α^*
0

a reactor at a nuclear power plant exploded and melted down during a poorly-organized experiment (World Nuclear Association 2022). Inside the borders of present-day Ukraine, the event released a tremendous amount of radiation and caused significant effects over a wide region. Though the exact toll of the disaster is unknown due to the long-lasting effects of radioactive exposure, dozens of individuals were killed in the immediate response, with thousands of cases of cancer potentially attributed to the disaster over the decades that followed (World Nuclear Association 2022). A report by researchers at the University of Southern California has estimated the price tag of the disaster as approaching $700 billion, and an incredibly large piece of land surrounding the reactor remains contaminated and uninhabitable (Samet & Seo, 2016).

The second event was the Fukushima Daiichi disaster in Fukushima, Japan. On March 11, 2011, a major earthquake and resulting tsunami off the coast of Japan led to a meltdown of multiple reactors at a nuclear power plant (World Nuclear Association 2023). Flooding and power losses compromised the cooling abilities of the reactor cores, leading to a catastrophic failure and a significant amount of localized contamination. The disaster resulted in no confirmed radiation-related deaths, but 100,000 individuals were initially evacuated, with returns often taking years (World Nuclear Association 2023). Recent estimates have projected the costs of the nuclear incident to approach $200 billion (Committee on Lessons Learned from the Fukushima Nuclear Accident for Improving Safety and Security of U.S. Nuclear Plants 2014), a tremendous toll to a region and nation rocked not only by this nuclear event but also by the major earthquake that led to it.

Both of these crises represent significant situations which shared a number of key similarities. First, there was essentially no advance warning of the events. Though nuclear emergency procedures are fairly well-documented, neither crisis had any meaningful warning signs of an imminent calamity. Therefore, it was very much a responsive, one-shot game, with little-to-no opportunity to evaluate anything but immediate decisions. Second, there

was an incredibly high cost of response (λ) and a relatively high desire for response from the citizenry (x_c), a product of long-standing fear of nuclear incidents. Nuclear cleanup is dangerous and costly, and though a proper response is very important (a high β), it requires an incredible investment to pursue. As a result, a state may be incentivized to seriously under-respond, a decision driven by the incredible cost that a more-appropriate response will incur.

It is with this last point that the difference between the Soviet and Japanese responses can be greatly evaluated. I do not intend to argue that either response was either totally perfect or entirely mangled. However, extensive research into both crises has generally found the Japanese response to be comparatively more adequate than that of the Soviet Union. The Nuclear Energy Institute (2019) identified rapid responses from Japanese officials, including mass evacuations, the distribution of protective potassium iodide, and restrictions on the shipment of food from contaminated areas. Absolutely, the Japanese response was far from perfect; numerous flaws in the response, as well as improperly addressed risk factors that had ultimately led to the crisis, all contributed to the disaster as a whole (Aoki & Rothwell 2012, Committee on Lessons Learned from the Fukushima Nuclear Accident for Improving Safety and Security of U.S. Nuclear Plants 2014). But, the democratic government, facing relatively strong institutions of accountability, enacted costly responsive policies.

This is fairly easy to contrast with the Chernobyl disaster, an incident whose response has become symbolic of the suppression and inefficacy of the Soviet state. The government took nearly every step possible to first ignore, then later minimize, the crisis at hand. The state refused to publish information about the incident and attempted to conceal it both from neighboring countries and from Soviet citizens themselves; even once acknowledging the incident, they downplayed its severity and attempted to distract from its nature (Gorbachev 1986). The announcement by the government to local residents on April 27, more than a full day after the disaster[17], is clearly an under-reactive statement:

[17]The disaster occurred in the very early morning of the 26th.

> For the attention of the residents of Pripyat! The City Council informs you that due to the accident at Chernobyl Power Station in the city of Pripyat the radioactive conditions in the vicinity are deteriorating. The Communist Party, its officials and the armed forces are taking necessary steps to combat this. Nevertheless, with the view to keep people as safe and healthy as possible, the children being top priority, we need to temporarily evacuate the citizens in the nearest towns of Kiev region.... Please keep calm and orderly in the process of this short-term evacuation.
>
> Evacuation announcement in Pripyat, 27 April 1986 (14:00)

The Soviet government did not acknowledge the explosion to the international community until Swedish scientists detected unusually high radiation from drifting fallout days after the explosion (United Nations 2024). Even after this discovery, public communications by the Soviet state showed great minimization of the crisis, a continuation of efforts to both minimize public concern and avoid having to undertake an incredibly costly response. The entire first communication from the Soviet state reads:

> "An accident has occurred at the Chernobyl nuclear power plant as one of the reactors was damaged. Measures are being taken to eliminate the consequences of the accident. Aid is being given to those affected. A Government commission has been set up." (Schmemann 1986)

This response is incredibly optimistic, particularly coming days after the largest nuclear incident in human history. Yet, it reflects the continuation of the lagging, insufficient response that came to define historical narratives of Chernobyl. The Soviets did not adequately distribute iodine, delayed evacuations, and continued to act reactively and insufficiently in responding to the accident (Geist 2017, Patel 2024). Though the Japanese response to Fukushima was far from perfect, the accountable nature of a democratic system pushed the

state to incur costly response policies in the interest of appropriately responding to the crisis. Yet, the Soviet state, facing no credible electoral or democratic threats, was hesitant to incur these high costs, and ultimately played an both insufficient and unpopular γ^*. In the face of high responsive costs, the desire of the citizenry to seriously address the crisis created a circumstance of democratic efficiency that pushed the Japanese government to a stronger response and the Soviet government to a weaker one.

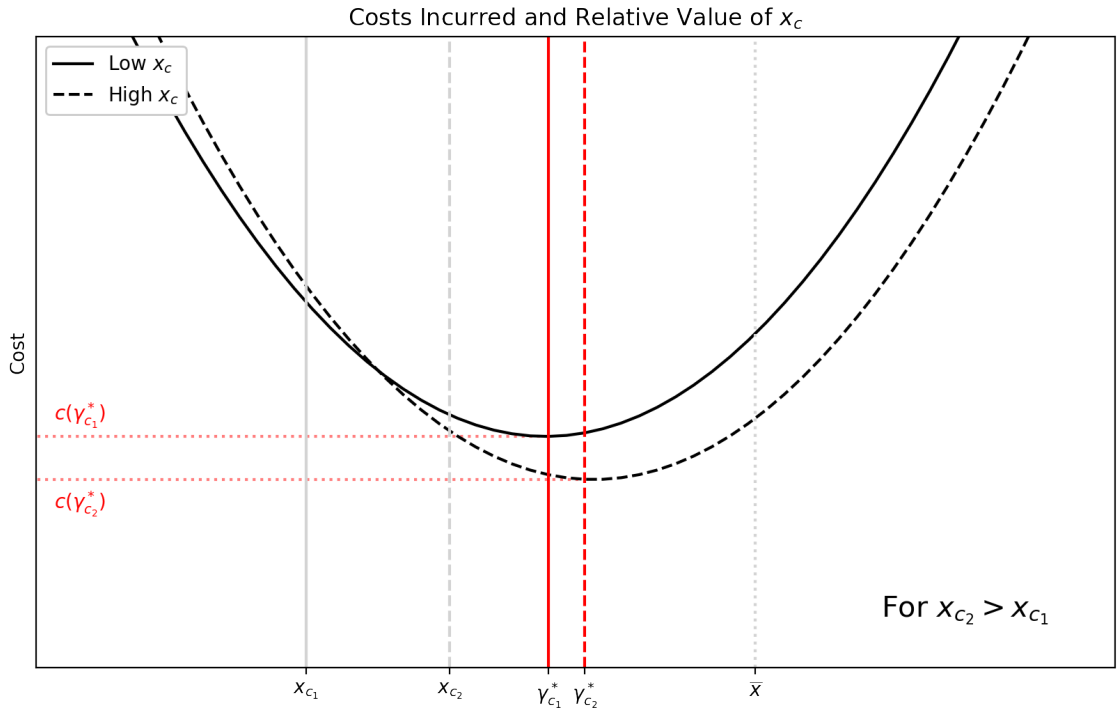
4.6 Optimizing x_c

In evaluating the results of γ^* throughout this model, an interesting point arises: even though γ^* reflects the policy which inflicts the lowest possible cost by the state given the parameters present, the actual cost incurred varies. Recall that in the general solution, we are only optimizing $c(\gamma)$ with respect to α as we assume that all other parameters are fully exogenous and cannot be manipulated by the state or the citizenry. Therefore, as these parameters change, the value of $c(\gamma^*)$ may change as well - and, since the state is a rational actor, they would seek the minimization of $c(\gamma)$.

Given that the state would seek this optimization, how might that propagate? The state has long-term policy levers to potentially adjust β and λ; but, within the scope of this model, these are not immediately adjustable. However, there is one parameter that could possibly be modified by the state: the beliefs of the citizenry. Figure 18 displays an example of this. Note that when the value of x_c is changed, not only is γ^* shifted (as we would expect), but so is $c(\gamma^*)$. Further note that not only does $c(\gamma^*)$ change, but so does γ^* itself with regards to $\bar{x}$.

It is likely not possible for the state to totally shape the ideal point of the citizenry. However, every state possesses not only a coercive capacity to enact and enforce a policy but also a persuasive capacity to shape information and to some extent alter the will of the people. Means such as propaganda, even in the weakest definition of the word, can have

Figure 18:



various impacts on what this model defines as x_c.

In authoritarian states, the capacity to enact this coercion is generally seen to be greater. The often-centralized nature of news and media, restrictions on petition and free speech, and low public transparency all enable the state to have some control over the dissemination of information and accordingly the opinions with which the public. This control is neither perfect nor complete - authoritarian states may often be incentivized to allow some dissent in an effort to maintain a balance of public order and peace. Even beyond intentional imperfections in this control, it is virtually impossible for any state to totally control the will of the people. Theoretically, this would require some combination of the following conditions:

1. Perfect monitoring of all citizens
2. Brutal and perfectly-coercive sanctioning for any violation
3. Flawless desire for perfect compliance by each citizen

Human nature allows for none of these to be possible in any realistic scenario. Empirical evidence can further support this - for example, protests in China against extremely strict COVID-19 restrictions, dissent throughout the history of the USSR, the maintained presence of some legal noncompliance in North Korea. Yet, while we cannot expect the state to be able to perfectly shape x_c, the knowledge that they may be able to substantially alter its value is an intriguing proposition. Previous scholarship has explored the importance of this relationship. In particular, I point towards the work of Schwartz (2012), whose exploration of the varying responses to the SARS epidemic in China and Taiwan - and, in particular, highlights why the Chinese response was so much more effective - cites the state's ability to shape public opinion as being a defining factor in the authoritarian response. By actually shifting the ideal point of the citizenry, the state was able to enact a more effective response policy.

The overarching question here becomes: what is the state's ideal point for x_c? In other words, what value of x_c results in the state's best response incurring the lowest cost possible? Though we again do not imply that a state has the ability to perfectly enact their ideal x_c, we hold true that the state may have some ability to influence it, and that an authoritarian state may have a greater ability to influence it than democratic counterparts. Critically, we must note that the state is incentivized to minimize their own cost incurred, which is not necessarily consistent with the normative definitions of policy efficiency used within this paper. The β parameter, encapsulated within this cost optimization problem, reflects the state's desire to implement an efficient policy. However, even beyond the state's modeled influence to move γ towards $\bar{x}$ as part of the cost function, it is possible for a state's influence on x_c to alter the distance between the best response and the state of the world. Therefore, we must further ask: When does the state's persuasive capacity incidentally move γ^* towards $\bar{x}$?

4.6.1 A General Solution

To identify the state's ideal value of x_c, which I denote x_c^*, we must find the value of $x_c|(\alpha, \beta, \lambda, \bar{x})$ which minimizes the cost incurred by the state. I represent this below:

$$x_c^* = \arg\min_{x_c} c(\gamma^*)$$

$$x_c^* = \arg\min_{x_c} \left[\lambda(\gamma^*) + \alpha(\gamma^* - x_c)^2 + \beta(\gamma^* - \bar{x})^2\right]$$

$$x_c^* = \arg\min_{x_c} \left[\lambda(\frac{-\lambda + 2\beta\bar{x} + 2\alpha x_c}{2(\alpha+\beta)}) + \alpha(\frac{-\lambda + 2\beta\bar{x} + 2\alpha x_c}{2(\alpha+\beta)} - x_c)^2 + \beta(\frac{-\lambda + 2\beta\bar{x} + 2\alpha x_c}{2(\alpha+\beta)} - \bar{x})^2\right]$$

Fortunately, quick intuition can allow us to slim this function down a bit. Because each section represents an added cost, the lowest overall cost - and thus, the solution to x_c^* - will be obtained when $\gamma^* = x_c$. Therefore, the accountability term is zeroed, and we can now express the following:

$$x_c^* = \arg\min_{x_c} \left[\lambda(\frac{-\lambda + 2\beta\bar{x} + 2\alpha x_c}{2(\alpha+\beta)}) + \beta(\frac{-\lambda + 2\beta\bar{x} + 2\alpha x_c}{2(\alpha+\beta)} - \bar{x})^2\right]$$

This path demonstrates the mathematical process formally present, but is a bit clunkier than we need (although it does produce the proper result). Instead, let us recall the general solution:

$$\gamma^* = \frac{-\lambda + 2\beta\bar{x} + 2\alpha x_c}{2(\alpha+\beta)}$$

If we want the accountability term to be zeroed out, we must set the best response equal to the will of the citizenry such that $x_c - \gamma^* = 0$. If $x_c = \gamma^*$, then we can simply set this expression equal to x_c and solve:

$$\frac{-\lambda + 2\beta\bar{x} + 2\alpha x_c}{2(\alpha + \beta)} = x_c$$

$$\gamma^* = x_c^* = \frac{2\bar{x}\beta - \lambda}{2\beta}$$

This is our general solution for x_c^*, and represents the value of x_c which would minimize the cost of the state's best response given all other parameters. Though a simple expression, there is a tremendously important intuitive conclusion we can reach here:

Proposition 4: The state's optimal point for the will of the citizenry is strictly lower than the social planner's best policy for all non-zero cases of the state of the world. Observe that in our expression for x_c^*, we can algebraically rearrange to see:

$$x_c^* = \frac{2\bar{x}\beta}{2\beta} - \frac{\lambda}{2\beta}$$

$$x_c^* = \bar{x} - \frac{\lambda}{2\beta}$$

Since we hold $\lambda > 0$ true, it is necessary that x_c^* must always be lower than $\bar{x}$. The only exception to this would occur if $\bar{x} = 0$, in which case $x_c^* = 0$. This introduces us to an important boundary condition here. Since we require that $\gamma^* \geq 0$, once x_c^* reaches 0, it is not possible for it to progress past 0. At this point, any further weakening of β, strengthening of λ, or lessening of $\bar{x}$ will not further affect x_c. We can solve this by identifying where $\gamma^* = x_c^* = 0$:

$$2\bar{x}\beta - \lambda \leq 0$$

$$2\bar{x}\beta \leq \lambda$$

$$\text{If } \lambda \geq 2\bar{x}\beta, \text{ then } x_c^* = 0.$$

This proposition is significant: per this model, in any crisis, the state is best off when the citizenry desires a response that is *at least slightly less than the actual best policy.* The direction of belief-shaping intentions is not necessarily always negative - note that if $x_c < x_c^*$, then the cost of implementing an insufficient policy is strong enough that the state is incentivized to call for a stronger response preference from the citizenry - but, the ultimate goal of policymakers is not to persuade citizens that the crisis is as severe as it is, but rather, to convince them that it is *slightly less severe.*

To better conceptualize the impacts that our parameters have on x_c^*, we can identify some relevant partial derivatives. We can solve:

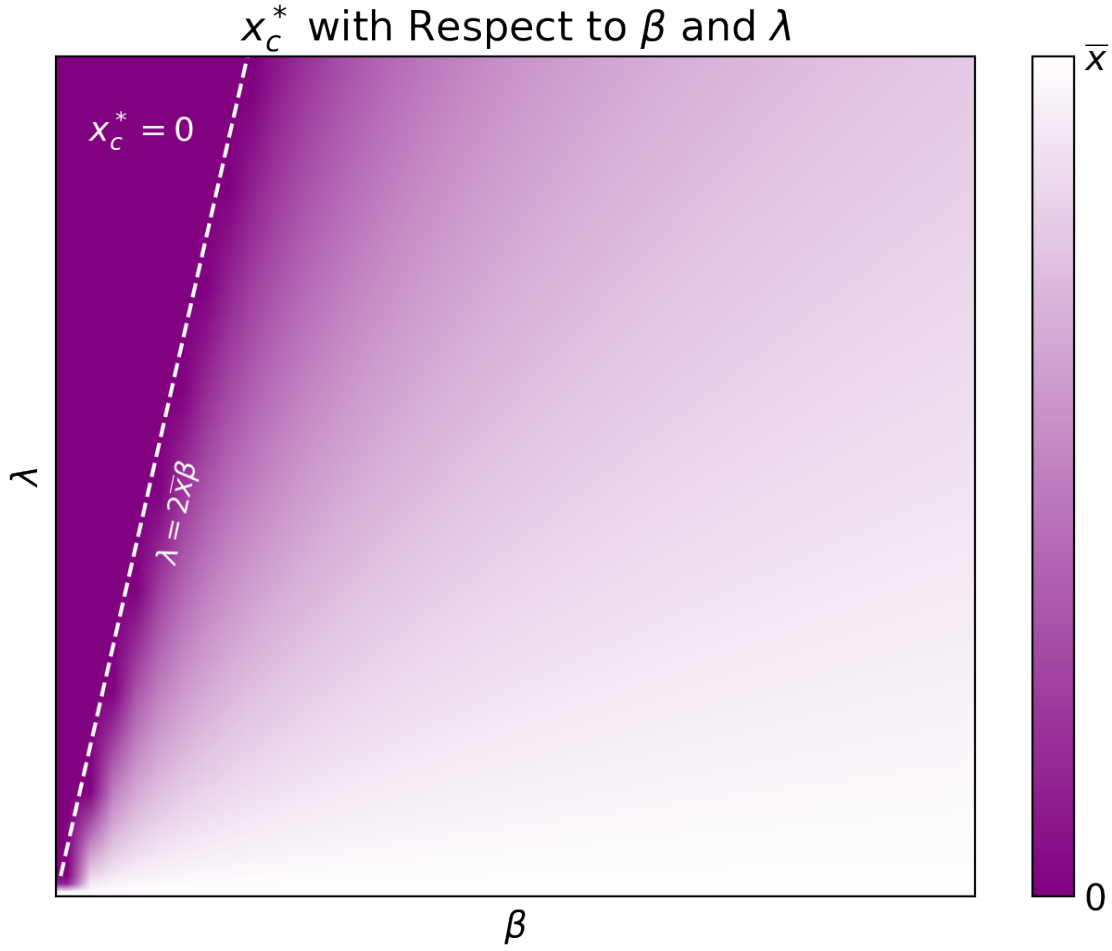
$$\frac{\partial x_c^*}{\partial \beta} = \frac{\lambda}{2\beta^2}$$

$$\frac{\partial x_c^*}{\partial \lambda} = \frac{-1}{2\beta}$$

$$\nabla x_c^*(\beta, \lambda) = \langle \frac{\lambda}{2\beta^2}, \frac{-1}{2\beta} \rangle$$

Figure 19 below demonstrates a mapping of x_c^* responding to these parameters and this solved gradient vector. Note the left-hand side reflects the boundary $\lambda \geq 2\bar{x}\beta$, above which $x_c^* = 0$. Further note that this reflects the condition that $0 \leq x_c^* < \bar{x}$. Since x_c cannot be negative, there is no rational incentive for $x_c > \bar{x}$, and $x_c^* = \bar{x}$ cannot be true due to the condition that $\lambda > 0$.

Figure 19:


x_c^* with Respect to β and λ
$x_c^* = 0$
$\lambda = 2\bar{x}\beta$
λ
β
$\bar{x}$
0

4.6.2 Welfare Analysis Implications

In some conditions, it may be true that the state's optimizing x_c results in γ^* becoming closer to $\bar{x}$ - our welfare analysis term, and thus our normative condition for regime efficiency. This occurs because any movement in x_c when all other parameters are held constant will be accompanied by a movement in γ^* in the same direction. Because of this, if a movement in x_c is towards $\bar{x}$, then γ^* will also move closer to $\bar{x}$ (albeit not necessarily - and in fact, almost certainly not - by the same amount). In this way, the persuasive capacity of a state may incidentally create a "better" or "worse" policy. To evaluate the circumstances wherein this may occur, we can evaluate the arrangements of the values of x_c, $\bar{x}$, and x_c^*. We can identify six possible and relevant[18] arrangements.

- A) $x_c < x_c^* \leq \bar{x}$
- B) $\bar{x} \leq x_c^* < x_c$
- C) $x_c^* < x_c \leq \bar{x}$
- D) $\bar{x} \leq x_c < x_c^*$
- E) $x_c^* \leq \bar{x} < x_c$
- F) $x_c < \bar{x} \leq x_c^*$

There is a useful lemma which we can use to characterize each of these six conditions:

Lemma 3: If the sign of $(x_c^* - x_c)$ is the same as the sign of $(\bar{x} - x_c)$, then the state's persuasion will move γ^* closer to $\bar{x}$; else, further.

Let us construct a circumstance wherein the state's persuasion in pursuit of achieving $x_c = x_c^*$ moves γ^* closer to $\bar{x}$ - in other words, where if a state were to persuade the citizenry to near the state's ideal will of the citizenry, then the resulting best response will grow nearer

[18] With regards to $<$ versus $\leq$.

to the state of the world. I define that circumstance as "efficient persuasion," wherein the influence of the state will result in a normatively better policy. Conversely, we can construct a circumstance wherein the pursuit of x_c^* ultimately moves γ^* further from $\bar{x}$, and define it "inefficient persuasion." Given these labels, we must simply identify for each of our six arrangements what will result from a change in x_c towards x_c^*. We can solve this easily for the first four:

- A) $x_c < x_c^* \leq \bar{x}$ In this case, x_c and x_c^* are on the same side of $\bar{x}$, with x_c^* in the same direction of x_c as $\bar{x}$. In such a case, since any movement of x_c towards x_c^* will be towards $\bar{x}$, the accompanying movement in γ^* will be towards $\bar{x}$, and we have **efficient persuasion** with influence towards a greater γ^*.

- B) $\bar{x} \leq x_c^* < x_c$ In this case as well, x_c and x_c^* are on the same side of $\bar{x}$, with x_c^* in the same direction of x_c as $\bar{x}$. In such a case, since any movement of x_c towards x_c^* will be towards $\bar{x}$, the accompanying movement in γ^* will be towards $\bar{x}$, and we have **efficient persuasion** with influence towards a lesser γ^*. Note that, were γ^* to dip below $\bar{x}$, this would become inefficient - but, because x_c^* is itself an optimized version of γ^*, we define this scenario to only include $\gamma^* \geq \bar{x}$.

- C) $x_c^* < x_c \leq \bar{x}$ In this case, x_c^* is in the opposite direction from x_c as $\bar{x}$. In such a case, since any movement of x_c towards x_c^* will be away from $\bar{x}$, the accompanying movement in γ^* will be away from $\bar{x}$, and we have **inefficient persuasion** with influence towards a lesser γ^*.

- D) $\bar{x} \leq x_c < x_c^*$ In this case as well, x_c^* is in the opposite direction from x_c as $\bar{x}$. In such a case, since any movement of x_c towards x_c^* will be away from $\bar{x}$, the accompanying movement in γ^* will be away from $\bar{x}$, and we have **inefficient persuasion** with influence towards a greater γ^*. (Note that it could be possible that λ is so high that $\gamma^* < \bar{x} < x_c < x_c^*$. However, even if this were to be the case, the movement of x_c

towards x_c^* would still result in a decreasing movement of γ^*, therefore further away from $\bar{x}$.

For items E and F, a bit more reasoning is involved. Namely, because $\bar{x}$ is in between x_c and x_c^* in both of these scenarios, the state's persuasion will initially move x_c towards $\bar{x}$, but eventually, x_c will pass $\bar{x}$ and begin to move further from it. This is very similar to the directional analysis from Section 4.4.2; there is an initial period of efficiency that ultimately erodes. Fortunately, however, because x_c, x_c^*, and $\bar{x}$ are all continuous parameters, we can conceptually identify the following relationships:

- E) $x_c^* \leq \bar{x} < x_c$ In this case, x_c will be pulled towards the lesser x_c^*, and therefore, persuasion will result in γ^* decreasing. *So long as this condition is met* - i.e., until $\gamma^* = x_c$ - we can identify **efficient persuasion** with influence towards a lesser γ^*. Therefore, state persuasion *could* be efficient here, but only to the extent that $\gamma^* \geq \bar{x}$. Once $\gamma^* < \bar{x}$, then we identify **inefficient persuasion** with influence towards a lesser γ^*.

- F) $x_c < \bar{x} \leq x_c^*$ In this case, x_c will be pulled towards the greater x_c^*, and therefore, persuasion will result in γ^* increasing. *So long as this condition is met* - i.e., until $\gamma^* = x_c$ - we can identify **efficient persuasion** with influence towards a greater γ^*. Therefore, state persuasion *could* be efficient here, but only to the extent that $\gamma^* \leq \bar{x}$. Once $\gamma^* > \bar{x}$, then we identify **inefficient persuasion** with influence towards a greater γ^*.

This is much that can be gleamed from this section of the model, and like many models, there is much that can be explored of each parameter that is beyond the scope of this paper. Rather, the most important takeaway from this discussion of optimizing x_c is that the ideal value of x_c for the state will always be less than $\bar{x}$, and that therefore it is always in the best interest of the state for the citizenry to be at least slightly-less-than-appropriately concerned.

The extent to which $x_c^* < \bar{x}$ varies greatly, and is a result of the balance between λ and $\beta\bar{x}$; a left-heavy balance results in a lower x_c^* while a right-heavy balance results in the opposite. Intuitively, this makes sense - because any response by the state is costly, there will always exist at least some value of $x_c < \bar{x}$ wherein the best response γ^* constructed through the given x_c incurs a slightly lower cost on the state than would $x_c = \bar{x}$, as there is less investment required. Normatively, however, this is a nightmare, as it signals that it is never in the best interest of the state to have the citizenry desire an objectively adequate solution.

This approach towards the model is incredibly consistent with Schwartz's SARS analysis: the ability of the state to shape public opinion can have a significant effect on crisis outcomes. My work shows this to be true, and further explores when these effects may be efficient or inefficient. In the SARS epidemic that Schwartz evaluates, the preexisting trust in government and the ability of the state to shape media communications are cited as being crucial advantages held in China that Taiwan did not enjoy. Though early suppression of information "fomented rumour and panic" (Schwartz pp. 326), the Chinese government pivoted to an approach of surprising honesty and information. They provided accurate case counts, information about the virus and its effects, and a balanced message of hope, encouragement, and urgency. In this case, we can reasonably assume the following: $x_c < \bar{x}$, $\alpha < \beta$, $\gamma^* > x_c$, and $x_c < x_c^*$. The result was a greater value of γ^* than would be present with a higher α, and a circumstance of efficient persuasion. This convinced the citizenry that a costly, arguably-oppressive response was necessary, and productively influenced x_c such that γ^* grew closer (though still below) to $\bar{x}$.

Pandemics are a convenient medium to discuss these influences due to their high cost of response and the frequent inconsistency in citizens' desire to incur such costs. The COVID-19 pandemic, beyond serving as a key motivation for this paper, provides an intriguing opportunity to evaluate public communications and the ways in which the influence of the state may be either productive or unproductive. I discuss this more extensively below.

4.6.3 Applications to COVID-19 In the United States

We can see potential examples of this in a wide range of crisis response policies, particularly wherein the costliness a state incurs by enacting a response would incentivize them to push for a less-than-adequate policy. The United States' central response to COVID-19 is a simple yet powerful example of this phenomenon. Adequately responding to such a severe pandemic required incurring previously unthinkable costs; early estimates reached as high as a catastrophic $16 trillion price tag on the pandemic as a whole(Cutler & Summers 2020)[19]. Such projections were, although originally debated, ultimately fairly representative of the actual cost of the pandemic and according responses, with more recent and robust scholarship estimating a $14 trillion response price tag through the end of 2023 (Walmsley et al 2023). This responsive cost is unsurprising considering the challenges it posed: implementing and enforcing a shift to virtual environments and platforms, mass-producing and subsidizing vaccinations and preventative restrictions, and providing stimulus packages all come with a hefty price tag. Note that I consider this differently than costs incurred by failing to respond - for example, the cost of deaths, healthcare costs, etc. These considerations are captured in the β parameter, which is at odds with λ here, but we can begin to see the incredible degree of λ.

This financial loss may also propagate through decreases in tax revenue, an effect of restrictive response measures. Though the wider impacts of the pandemic most certainly impacted global economics, particular attention in the early stages of the pandemic was paid towards the potential lost economic activity and tax revenues that government-imposed lockdowns would probably cause. Early projections - and later reflections - both described catastrophic impacts to spending, with significant reductions in consumer spending antic-

[19]Note that the Cutler & Summers analysis interestingly includes the actual financial cost of a life lost to COVID-19, using a field-accepted value of approximately $10 million (Robinson 2020). This figure would more appropriately be encapsulated within the β variable of my model (alongside other healthcare costs), which is actually at odds with the λ variable that this section is slightly more concerned with. However, a breakdown of the Cutler & Summers estimate still shows an estimated roughly $7.6 trillion loss in GDP due to the pandemic.

ipated and ultimately recorded (Andersen et al 2020, Coibion et al 2020). A significant proportion - though debated in exact magnitude - of this reduction in consumer spending has been traced back to lockdowns enacted both in and beyond the United States, with mandated restrictions on gatherings and in-person activities reducing economic activity across the board (Fairleigh & Fossen 2021). These effects were further cyclical; as the economy took both intentional shocks from lockdowns and exogenous shocks from individual decisions to stay at home, secondary effects became quite significant as the initial economic slowdown further reduced consumer spending. The result of this is multifaceted but straightforward to conceptualize - decreased profits for businesses large and small, reductions in income for many Americans, and lower consumer spending all results in a shrunk tax pool, a cost incurred by the government (Clemens & Veuger 2020; Morton & Hinchliffe 2020).

These cost transcend mere financial and material commitments, however. The personal costs to mental and social wellbeing caused by lockdowns and restrictions is significant and notable, and represents the extraordinarily high λ cost of the pandemic. Though the long-term impacts of closing schools would not be realized for years - and are, in fact, still being realized piece by piece - it was reasonably clear that there would be some high cost therein. And, it should be noted, the citizenry as a whole was willing to endure these changes; as I discuss below, there was a genuine belief from the citizenry that some costly response was necessary because of the threat the pandemic posed. But, the response was costly, and no American could reasonably say that they felt none of the costs associated with it.

The known aversion of the populace to incur these costs, even to the extent the citizenry desired to do so, likely became a political flash-point. The pandemic's timing, beginning around eight months before the 2020 U.S. Presidential Election, generally made the federal government and the Trump administration more hesitant to enact costly policies, particularly given that the cost of such policies would probably be realized long before the benefit. The state was certainly accountable to the citizenry in this regard, but because the apparent

value of λ was so high - it was, again, not an unknown possibility that lockdowns would severely harm the national economy and thus reelection prospects, all else held equal - there was a significant incentive for the government to pursue policies somewhat below those that would be omnipotently optimal for "solving" the crisis at hand. To actually target the state of the world policies of widespread, total lockdowns would be to voluntarily shatter one of the Trump campaign's key arguments - a strong economy - for reelection at a critical point in the democratic cycle. To target a somewhat-less-severe response, one could potentially sacrifice some (not all) of the "altruistic" cost in the interest of lowering "responsive" costs.

Per this theory of optimizing x_c, the state incurs the lowest cost when $x_c = \gamma^*$. As a result, given the state's incentive for a less-than-optimal response, they would be incentivized to shift x_c towards $x_c^* < \bar{x}$. In other words, the state would ultimately be be best off convincing the citizenry that the crisis was less severe than it was. So began what I argue to be a tremendous theoretical foundation of the tension between the Trump Administration and his conservative allies, and otherwise not-politically-motivated public health and medical organizations.

Recall that early policies and communications from the federal government actually represented a fair deal of severity, enacting genuine responses and rallying citizens to engage in what was at least thought to be effective, albeit costly, actions. President Trump declared a state of emergency on March 13, 2020, expanding federal latitude in responding to the pandemic; prior to this, on March 11, he had addressed the nation and acknowledged both the severity of the crisis and the imposition of travel restrictions and other such public health measures. Critically, though, note the balance in the President's address between severity and minimization:

> "This is the most aggressive and comprehensive effort to confront a foreign virus in modern history. I am confident that by counting and continuing to take these tough measures, we will significantly reduce the threat to our citizens, and we

> will ultimately and expeditiously defeat this virus. From the beginning of time, nations and people have faced unforeseen challenges, including large-scale and very dangerous health threats. This is the way it always was and always will be. It only matters how you respond, and we are responding with great speed and professionalism.... After consulting with our top government health professionals, I have decided to take several strong but necessary actions to protect the health and wellbeing of all Americans...."
>
> "The vast majority of Americans: The risk is very, very low. Young and healthy people can expect to recover fully and quickly if they should get the virus."

Through September of 2023, the U.S. Centers for Disease Control and Prevention has recorded 75,391 deaths of individuals younger than fifty years of age due directly to COVID-19. This is rather at odds with Trump's insistence that the vast majority of Americans - in particular, those who are younger or middle-aged - have only a minimal threat of harm. Note, however, Trump's willful acknowledgement of the severity of the situation, and his spoken support for significant response steps. Though analysis of public opinion to the onset of the pandemic is easily enough for several dissertations, a helpful starting point can be found in a poll conducted by the Pew Research Center in March of 2020. Conducted between March 10 and 16 - right as widespread American quarantines began - the survey captures a few significant points about early public beliefs. During this period, only 47% of respondents considered the pandemic to be a major threat to public health, and a much smaller 27% considered it a threat to their personal health.

This presents an interesting conundrum: the citizenry clearly desires a non-zero response, but is actually inadequately concerned for the severity of the pandemic and the necessity of a significant response; at the same time, the state is facing high costs from either appropriately responding or failing to do so. Noting the seriousness of Trump's remarks, a few causal pathways seem to be arising. Quickly learning of the potentially catastrophic responses for

inadequately responding, the administration would have an incentive to minimize $\beta(\gamma - \bar{x})^2$ while balancing it with $\lambda\gamma$. To this extent, the optimal value of x_c^* would occur with a greater value of x_c than presently existed. In other words, the best response of the state would become less costly if the citizenry wanted a more significant response than they currently preferred. This makes sense - if the citizenry wants an inadequate response, it is reasonable that as the state would be best off playing a much stronger policy, they would benefit from convincing the citizenry of this severity. Hence Trump's seriousness - since $x_c < x_c^* < \bar{x}$, this becomes a case of efficient persuasion wherein the state's incentivized influence actually draws γ^* closer to $\bar{x}$.

This immediate focus on emphasizing severity was actually fairly effective; a later Pew survey conducted between March 19 and 24 - less than two weeks after the original survey and the President's remarks - found that 66% of Americans considered the pandemic to be a "major threat" to public health with a further 88% calling it a "major threat" to the national economy. And, for some time, the government's response continued to emphasize the importance of a significant response to the crisis, albeit tempered by reassurance that the pandemic was ultimately not *quite* as severe as some had thought. The government continued to enact strong-yet-imperfect policies throughout the first weeks of the pandemic (Goitien 2020), including the publication of conservative-yet-reasonably-significant loss of life projections (Pew Research Center 2020).

Yet, the minimization of the pandemic's severity set the stage for inadequate responses and public dissent. The same Pew Research Center poll that found only a minority of Americans saw the pandemic early on as a significant public health risk further also identified that a majority of respondents thought President Trump was not taking the pandemic seriously enough, a potential manifestation of $\alpha(\gamma - x_c)^*$. Criticism began to grow over the broader response to the pandemic, with concerns over both the government's ignorance of the pandemic and the quickly-increasing cost of lockdowns (Weiland & Haberman 2020, Mandel &

Veetil 2020). Though the president at first continued to acknowledge the severity of the pandemic and the need for costly responses (White House 2020), this quickly gave way to an onslaught of obfuscation and denial. Summers' (2020) timeline of Trump's response points towards his opposition towards mask mandates in early April, with Trump ultimately stating just weeks before the 2020 election that the virus "affects virtually nobody" (O'Kane 2020). Perhaps the most damning indication of this came in an interview Trump gave in September of 2020, where he stated:

> "I wanted to always play it down. I still like playing it down."

Efficient persuasion became inefficient as the will of the citizenry ultimately grew higher than x_c^*, which was heavily influenced by the high λ of the pandemic.[20] As a result, though the government first invited a more urgent response from citizens to encourage compliance and productive decision-making, it ultimately found itself struggling to minimize the impacts of the pandemic and push for $x_c < \bar{x}$.[21] The result was hundreds of thousands of lives lost, trillions of dollars in costs, and still a lost election. Just days before the 2020 election, the Washington Post released a tongue-in-cheek video entitled: "40 Times Trump Said The Coronavirus Would Go Away."

5 Conclusion & Future Research

The paradox of democracy is still unshakeable: an accountable government derives the quality of its decision-making by the quality of the will of the citizenry. To bind the government

[20] To some extent, this is merely a repeatedly-seen reflection of human nature and leadership. The truth is that even though the citizenry wanted a more intensive response for the sake of ending the crisis, they did not all want to incur the costs that such a response would entail. This is not to make a normative argument about Trump's response, nor to necessarily invite any sympathetic emotions, but rather to note the potential opposition between the α and λ terms in this crisis, and to justify the use of λ itself as a parameter that is independent from x_c or α.

[21] Further research would be wise to invoke discussions of trust here - the switch between the government playing up and playing down severity, as well as the longer-term realization of $\bar{x}$, could have possibly revealed to the citizenry the nature of the inefficient persuasion present.

by accountability is to protect the people from oppressive policy-making, but is also to prioritize what is popular over what is necessarily correct. When these two policies are similar, the accountability of a democratic government may indeed ensure that a well-informed and well-meaning populace can use their influence to produce optimal outcomes. Yet, when these policies are vastly different, this accountability may instead draw the focus of policy-makers towards what is desired but away from what is right.

This thesis is not intended to be a groundbreaking normative commentary on democracy. Rather, it lends a discussion of when democratic influences may be either productive or unproductive in responding to various crises. Furthermore, it discusses the influence of the state's persuasive capacity and how across regime types, this approach of information can significantly shape the course of a crisis and its response. In doing so, I hope to provide additional insight into debates of regime type and to expand our collective understanding of how certain states may be better-or-worse positioned to respond to the plethora of crises that continue to face modern governments. Though I do not directly contribute to normative suggestions of how to implement this understanding, further research and theorization could potentially identify structures and institutions of accountability which reflect these cost-driven boundaries and allow states to better respond to crises wherein they are presently disadvantaged. Research into separation of powers, checks and balances, and other institutional mechanisms may highlight means through which democratic states could suffer less accountability when the will of the citizenry is inconsistent with the state of the world. Similarly, research into tolerated dissent and autocratic accountability could lend insight into how authoritarian states might be able to better approach high-cost crises, though the general resistance of totalitarianism to accountability - and the relatively simple answer of "be more accountable" - make this impact less compelling than to that of present democracies. Lastly, the continued evaluation of the persuasive capacity of the state and the circumstances wherein that persuasion is efficient or inefficient can lend normative insights to scholars of propaganda and rhetoric, highlighting where this persuasion would best be maximized or

quieted.

In addition to these pragmatic extensions, I point towards a handful of directions which future modeling would be wise to explore. First, the relationship between λ and $\bar{x}$ stands to be further analyzed, particularly by specialists in models of public policy. It is likely that the state of the world policy, which represents the social planner's optimum, may itself include some consideration of crisis costliness. Separately modeling how a relationship between λ and $\bar{x}$ affects policy-making may yield more precise boundaries of accountability efficiency. More importantly, it may allow for a more pragmatic application of this model, as the notion of an objective and infallible state of the world policy, though useful to conceptualize mechanisms of decision-making, may be less applicable to social scientists or decision makers seeking to employ this model in future, specific crises.

The discussion of optimizing x_c lends a broad range of questions. In particular, though it is generally theorized that authoritarian states have a stronger ability to alter x_c than their democratic counterparts, the extent to which this is possible invites a great deal of inquiry. Presumably, there are circumstances wherein the trust built by a democratic system may actually strengthen its persuasive capacity beyond that of an authoritarian state which has maintained control of information but has minimal trust. Propaganda and centralized information is certainly compelling, but if the citizenry already sees the state as an antagonistic or oppressive figure, this persuasion may become less effective - if not entirely unproductive. This question of trust is significant here; if the direction of a state's persuasion changes over time, or if it is unclear that the state is a trustworthy source of information, the citizenry and state may ultimately end up in a signalling game with the citizenry unsure of whether or not to follow the persuasion of the state and the state accordingly deciding whether or not to accurately represent their own interests. Furthermore, a core consideration here is that the state cannot always optimize $x_c = x_c^*$; then, to what extent can they? Modeling this range according to regime type could further explore the range of persuasion reasonably possible.

In addition, with this range modeled, it could be possible - and, in fact, may be likely - that the state is initially aware of its persuasive capacity and therefore may seek to impose their influence at the same time as playing their responsive policy. In other words, the ability of the state to persuade the citizenry may factor into their initial value of γ^*, which could alter the regions wherein a democratic or authoritarian state would be most efficient.

The nature of the citizenry's payoff stands as another line of inquiry. In this model, the citizenry is non-strategic, and their preferences are single-peaked, symmetric, and tied only to their ideal policy value. I maintain that holding the citizenry as being non-strategic is the most effective way to evaluate decision-making in crisis, both due to the presumed inability of the citizenry to collectively organize their individual preferences and the notion that the citizenry would ultimately perceive their short-term payoffs as being primarily reflective of their optimal point x_c. I further hold that single-peaked preferences are most useful to employ in this model, though future research could apply different choice and payoff functions and analyze how multiple-peaked preferences might be reflected in the state's best response. For example, in a crisis such as COVID-19, a citizen could theoretically prefer first an extraordinarily strict response to limit all loss of life, then a very weak response to limit economic and social costs, and then lastly any moderate policy which may detract from both public health and economic wellbeing. This may be best applied in more specific crisis scenarios than broadly, due to the unique and oddly-distributed nature of multiple-peaked preferences, but it could prove useful in understanding how states may respond to more complex crises. In particular, this could be useful for evaluating crises where a response requires collective action; in such cases, a citizen might first prefer a mild response, then a severe one, and lastly a moderate one.

Perhaps, however, exploration of asymmetric citizenry preferences could quite interestingly represent a range of crises wherein the citizenry is sensitive to the ordinality of their preferences and a policy played by a state. The citizenry may disproportionately prefer the

state to either over-or-under-respond to a given crisis, which could in turn alter the state's best response. For example, if a response may incur substantial costs directly payed by the citizens, the citizenry may be more averse to overresponding than underresponding, thereby violating symmetry. On the contrary, if a crisis is substantially severe such that there is significant fear amongst the citizenry regarding the risk of an inadequate response, the citizenry may be more averse to underresponding than overresponsding. The extent to which this asymmetry would be influenced directly by values of λ, β, and $\bar{x}$ may warrant further discussion for these reasons; a higher β may perpetuate overly-cautious preferences, while a higher λ or $\bar{x}$ may lead to overly-relaxed preferences.

An additional field of inquiry would involve the relationships between the costs incurred by the states and the citizenry themselves. In this model, the citizenry and the state are two distinct actors. Yet, in reality, many of the costs incurred by the state are also felt by the citizenry. For example, the responsive cost of a policy (the $\lambda\gamma$ term) is eventually felt by the citizenry; a monetary expense is ultimately paid by the taxpayers, and a non-monetary cost (such as investments of time or social losses) are all felt by constituents as well. This model implies that these considerations are all captured by the x_c variable, but in reality, there may be an intertwined relationship between λ, $\bar{x}$, and x_c wherein the citizenry incurs additional costs as γ increases. This, itself, may be encapsulated by the previous discussion of an asymmetric accountability cost, but further analysis - and, potentially, empirical insights - are necessary to determine how this relationship might best be portrayed.

This provides a segue into the most significant next step in modeling that future research might discuss: the longer-term applications of this game and an extension to multiple periods (be that infinite or discrete). In reality, a state's response to a crisis is very rarely single-period, if for no other reason than mechanisms of accountability are largely delayed. A democratic state does not face its costs of accountability immediately; rather, elections later in time will ultimately be where this fate is realized. This period of time introduces a

number of potential modeling expansions; I most significantly point to the impact it has on the citizenry's utility. If an accountability mechanism (primarily an election) occurs at some point in the future, it is possible that various costs or positive payoffs are incurred between the time the state plays their and that future point. If that were to be the case, the citizenry may incur not only payoffs based on the difference between the state's policy and their preference, but may further encounter the effects of how far the policy was from the state of the world. In other words, the citizens would encounter not only their preferences, but also the quality of the policy itself. Were the citizens to realize this full effect, and were there to be a delayed period of accountability, it is possible that the state could be further rewarded for a "good" response beyond simply a popular one, and a range of democratic supremacy could further be defined. Further applications of an extensive model could also better explain the mechanisms of accountability held by the citizenry against the state, including a more robust approach to the will of the citizenry and the introduction of the citizenry's credible commitment to either reelect or oust. Though a range of possible expansions are uncovered by the introduction of a multi-period game, I find this one at present to be the most compelling in strengthening an understanding of accountable governance.

I lastly propose potentially the most pressing next steps for scholars seeking to bolster models of crisis response and accountability: using an empirical lens to better qualify this model and test it against a range of real-world crises. I discuss specific elements of action across COVID-19 and various nuclear disasters, and present hypothetical and logical arguments over a broader range of circumstances. But, deeper insights into the actual decision-making processes - not just the outcomes - of these crises, as well as a broader explanation of relevant crises, may lend a more comprehensive understanding of states' responses. In particular, primary accounts of the factors weighed in making responsive decisions could provide a most-compelling qualification of the mechanisms evaluated in this model. I employed direct quotes from American and Soviet leaders in an attempt to explore this pathway; deeper research into decision-making processes and internal communications would almost certainly

help further an understanding of how decision-makers actually come to policy outcomes in crisis. Though it is not always possible to directly map out the factors that lead to decisions, particularly due to the hectic and rapid-fire nature of many crises, a stronger first-hand look at these processes may be the most useful.

It is the essence of political science - and social science more broadly - to understand the relationships between the institutions across humanity and the policies, decisions, and results they ultimately produce. It is further the moral calling of science in general to apply this understanding to better our world. This model is not the endpoint of theoretical work surrounding accountability. In fact, I intend for it to be quite the opposite: a jumping-off point for empirical, theoretical, and mixed-methods work into how accountability may effect responses under threatening crises, which may help normatively evaluate how we might best employ governments to provide high-quality responses. In this way, it is not merely an indication of when certain regime types may be most effective, but rather a discussion of how the natural impacts of these systems of accountability may either work for or against the common good. Whether the role of government is to produce good policy or good governance is a career-guiding question that transcends this thesis. But, in evaluating the ways in which our institutions might be equipped to handle the circumstances where they are most necessary, I hope to make a contribution to this overarching question as a whole, and to lend my work to an understanding of how we might govern through times of crisis in a way that is both right and good.

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6 Appendix

6.1 Proof #1: Proof of $\lim_{\alpha\to\infty}\gamma^*$

$$\lim_{\alpha\to\infty} c(\gamma^*) = \lim_{\alpha\to\infty} \frac{-\lambda + 2\beta\bar{x} + 2\alpha x_c}{2(\alpha+\beta)}$$

$$= \lim_{\alpha\to\infty} \frac{-\lambda}{2(\alpha+\beta)} + \lim_{\alpha\to\infty} \frac{2\beta\bar{x}}{2(\alpha+\beta)} + \lim_{\alpha\to\infty} \frac{2\alpha x_c}{2(\alpha+\beta)}$$

$$= 0 + 0 + \lim_{\alpha\to\infty} \frac{\alpha x_c}{\alpha+\beta}$$

$$= \frac{\lim_{\alpha\to\infty} \alpha x_c}{\lim_{\alpha\to\infty} \alpha+\beta}$$

$$= \frac{\infty x_c}{\infty}$$

$$= x_c$$

$$\lim_{\alpha\to\infty} \gamma^* = x_c$$

6.2 Proof #2: Proof of $\lim_{\beta\to\infty}\gamma^*$

$$\lim_{\beta\to\infty} c(\gamma^*) = \lim_{\beta\to\infty} \frac{-\lambda + 2\beta\bar{x} + 2\alpha x_c}{2(\alpha+\beta)}$$

$$= \lim_{\beta\to\infty} \frac{-\lambda}{2(\alpha+\beta)} + \lim_{\beta\to\infty} \frac{2\beta\bar{x}}{2(\alpha+\beta)} + \lim_{\beta\to\infty} \frac{2\alpha x_c}{2(\alpha+\beta)}$$

$$= 0 + \lim_{\beta \to \infty} \frac{\beta \bar{x}}{\alpha + \beta} + 0$$

$$= \frac{\lim_{\beta \to \infty} \beta \bar{x}}{\lim_{\beta \to \infty} \alpha + \beta}$$

$$= \frac{\infty \bar{x}}{\infty}$$

$$= \bar{x}$$

$$\lim_{\beta \to \infty} \gamma^* = \bar{x}$$

6.3 Proof #3: Proof of $\lim_{\lambda \to \infty} \gamma^*$

$$\lim_{\lambda \to \infty} c(\gamma^*) = \lim_{\lambda \to \infty} \frac{-\lambda + 2\beta \bar{x} + 2\alpha x_c}{2(\alpha + \beta)}$$

No need to break this up into parts, as λ is only in the numerator

$$\lim_{\lambda \to \infty} c(\gamma^*) = \frac{-\infty + 2\beta \bar{x} + 2\alpha x_c}{2(\alpha + \beta)}$$

$$\lim_{\lambda \to \infty} \gamma^* = -\infty$$

$\gamma^* \in [0, \infty)$ is given, therefore within our function:

$$\lim_{\lambda \to \infty} \gamma^* = 0$$