Fake it 'Til You Make It:

Status Concerns and Crisis Suppression in International Politics

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1 Introduction

When epidemiologists in South Africa and Botswana identified and publicized their sequence of the Omicron variant of Covid-19, it renewed a debate about the efficacy and ethics of travel restrictions as tools to combat an ongoing global pandemic. Within days of being made aware of Omicron, the World Health Organization designated it a "variant of concern," and recommended that countries increase surveillance and sequencing, share their sequencing data, and report outbreaks of Omicron to the WHO.[1] Notably absent was a recommendation that countries restrict or ban travel from South Africa, Botswana, or nearby countries. Nevertheless, President Biden heavily restricted (effectively banning) travelers from 8 sub-Saharan African countries from entering the United States the same day that Omicron was designated as a variant of concern.[2] The European Union quickly reached an agreement to implement similar measures on many of the same countries.[3]

Without calling out any states or leaders by name, the World Health Organization quickly responded with thinly veiled criticism of the US and European response. As the WHO's statement makes clear, the identification, sequencing, and timely reporting of the Omicron variant was a public good that African epidemiologists provided for the rest of the world. Despite providing vital information to the global community, South Africa and Botswana were punished rather than rewarded:

> Blanket travel bans will not prevent the international spread, and they place a heavy burden on lives and livelihoods. In addition, they can adversely impact global health efforts during a pandemic by disincentivizing countries to report and share epidemiological and sequencing data[4]

[1] *Classification of Omicron (B.1.1.529): SARS-CoV-2 Variant of Concern.* Nov. 2021.

[2] Joseph Biden. *A Proclamation on Suspension of Entry as Immigrants and Nonimmigrants of Certain Additional Persons Who Pose a Risk of Transmitting Coronavirus Disease 2019.* Nov. 2021.

[3] Francesco Guarascio and Gabriela Baczynska. "EU countries agree to suspend travel to southern Africa over new COVID variant". In: *Reuters* (Nov. 2021).

[4] *WHO advice for international traffic in relation to the SARS-CoV-2 Omicron variant (B.1.1.529).* Nov. 2021.

This is especially concerning for the WHO since South Africa and Botswana were abiding by the commitments they made under the International Health Regulations agreement of 2005:

> Each State Party shall notify WHO, by the most efficient means of communication available, by way of the National IHR Focal Point, and within 24 hours of assessment of public health information, of all events which may constitute a public health emergency of international concern within its territory in accordance with the decision instrument, as well as any health measure implemented in response to those events.[5]

If states are punished rather than rewarded for abiding by these commitments, then they may be reluctant to raise the alarm when they identify potential public health threats, making the world a more dangerous place.

We need to look no further than the early days of the Covid-19 pandemic to see these concerns played out. The Chinese government appears to have known about the virus and that it was spreading for weeks (if not months) before the first officially acknowledged case.

It is puzzling that China chose to punish the epidemiologists who attempted to raise the alarm about the dangers of the emerging disease rather than report it to the WHO as required under the revised IHR. It may simply be a symptom of a broader shift away from multilateralism in "health diplomacy"[6] While it is true that states often flaunt their international legal commitments, it is unclear what *benefit* hiding an outbreak of novel infectious disease from the WHO confers. One possible explanation for China's response is the potential economic consequences of trade and travel restrictions. Researchers have found that states who rely more heavily on international trade and tourism tend to wait longer to report public health crises to the WHO, even controlling for the state's healthcare capacity.[7]

If we allow the possibility of non-material incentives, other possible explanations emerge. As one commentator put it last year:

[5] *International Health Regulations (2005), Third Edition*. 2016.

[6] Tanisha M. Fazal. "Health Diplomacy in Pandemical Times". en. In: *International Organization* 74.S1 (Dec. 2020), E78–E97.

[7] Catherine Z Worsnop. "Concealing Disease: Trade and Travel Barriers and the Timeliness of Outbreak Reporting". en. In: *International Studies Perspectives* 20.4 (Nov. 2019), pp. 344–372.

> China has every reason to cover up a virus that stained its prestige as a rising and sophisticated power with nearly 3.5 million people dead worldwide. Its nationalist leader Xi Jinping and the Communist Party have no time for shame of culpability that would mar their core case to the world – that their one party rule is a better fit for the 21st century than democracy – a narrative Biden has publicly vowed to combat.[8]

What I find so fascinating about this interpretation is the connection between the possibility of an intentional cover-up and China's "prestige as a rising and sophisticated power." Though it does not use the language of incentives and rationality, the implication of this excerpt is that China's unwillingness to acknowledge the virus' origin is driven by concern about its *status*.

While this argument may seem obvious to the general public, the idea that status motivates state behavior is more contentious in international relations. There has been a steady growth in the study of status as motivation over the last decade, but it remains ripe for further development. This paper makes two primary contributions. The first is to formalize the mechanism of status seeking behavior. The second is to extend the concept to a new arena: state response to crises. Formalizing the problem enables a more systematic examination of status seeking as a mechanism driving state behavior. Moving beyond the simple (and, by now, well established) claim that status *does* matter, it shows *how* and *when* status seeking might lead to behavior that seems otherwise irrational.

More specifically, the model includes a state which faces a crisis of unknown severity. The state wants to manage the crisis, but also wants to maximize other states' belief about its capability. The state's ability to manage the crisis without help depends in part on its capability, but also contains a stochastic element. Because a state cannot observe another state's capability directly, they must infer from what they can observe: whether the first state asked for help and if the crisis was managed successfully. The result is a typology of states in equilibrium, with optimal strategies determined primarily by a state's capacity.

[8] Stephen Collinson. "The Covid-19 origin storry has massive political consequences". In: *CNN* (May 2021).

The risk of failing to contain a crisis by attempting to manage it alone is worth the risk for some states, but other states are better off asking for help.

To understand the basic strategic logic of the model, consider a more common scenario: lost drivers. A lost driver can either stop and ask for directions, or try to press ahead and hope they eventually find their way again. Stopping to ask for directions reveals something that the driver would rather conceal: they took a wrong turn, did not have a proper route planned, do not know the area well, or are not capable of navigating without an aid. Not admitting that they are lost and asking for help is risky. If they do not get back on track quickly, their passengers will realize they are lost. This is the worst possible outcome; not only do passengers recognize the driver's incompetence, the driver is even more lost than before. This is a simple real-world example of the trade-off between asking for help and trying to conceal incompetence that can rationalize seemingly irrational behavior.

After describing the setup and analyzing the model, I present a non-technical summary of its dynamics. The core finding is that some states prefer to suppress a crisis and attempt to manage it on their own. The states that prefer this strategy fall into two categories: intermediate capacity states which are close to the cutoff between the low and intermediate types, and high capacity states that are close to the cutoff between the high and intermediate types. The latter are willing to forgo some status benefit in the interest of avoiding the cost of asking for help, while the former are willing to risk mismanaging a crisis in the hope of mimicking a higher capacity state. Low capacity states and intermediate and high capacity states in the upper range of their respective categories prefer to ask for help managing crises, but forgo the possibility of achieving status that exceeds their capacity.

To probe the plausibility of this framework, I explore two cases of nuclear crisis: Three Mile Island and Chernobyl. I examine whether the United States responded as the model predicts a state with the most advanced nuclear power capability would: even though they did not need help in managing the crisis, did they publicize it anyways? Then I look at the

Soviet response to Chernobyl. Did they intentionally cover up the crisis, in accordance with the behavior the model predicts for lower intermediate capacity states? In both cases, the answer is a clear yes. This initial test of the dynamics of the model are encouraging. I conclude by suggesting potential model extensions and more comprehensive empirical evidence than what is presented here.

2 Status as Motivation in International Politics

I use *status* to mean position within a hierarchy. This succinct definition is common in contemporary international relations work on the topic. [9] While succinct, it captures two essential aspects of status: it is fundamentally relational and implies different "expectations of behavior, rights, and responsibilities."[10] Status hierarchies can be either categorical (such as membership in a group) or continuous (specific ranking relative to other individual states).[11] In either case, status is undeniably a social phenomenon; it is only a legible concept in the presence of differentiated others. Just like people, states' status is determined by collective beliefs about their ranking in socially valued attributes.[12]

It is important not to reduce status to specific attributes though. If status is merely a mechanical function or reflection of a state's attributes, the social aspect is lost (or at least epiphenomenal). Attributes might relate to material capabilities (nuclear weapons, technological capability, wealth), which in turn affect status, but we should not give into the reductionist temptation. Status is *not* epiphenomenal to material capabilities. One way to understand these attributes is their symbolic role: specific attributes confer status only if

[9] see, for example, Renshon 2016 or Dafoe et al. 2014

[10] Allan Dafoe, Jonathan Renshon, and Paul Huth. "Reputation and Status as Motives for War". en. In: *Annual Review of Political Science* 17.1 (May 2014), pp. 371–393, pp. 373–4.

[11] Dafoe, Renshon, and Huth, op. cit.

[12] Deborah Welch Larson. "Status competition among Russia, India, and China in clubs: a source of stalemate or innovation in global governance". en. In: *Contemporary Politics* 25.5 (Oct. 2019), pp. 549–566.

others *recognize* them as symbols of higher social status.[13] Even those who do not necessarily share Duque's emphasis on symbolic power emphasize that status depends on the collective beliefs of others. Therefore, a change in status requires others to recognize the change.[14]

Another way to put this is that seeking improved status is driven by an intrinsic need for a positive *identity*. This is why, Welch Larson and Scevchenko argue, states that seek higher status tend to compare upwards, to those generally regarded as having *higher* status. While it may seem like a zero sum game (and is often treated as such by members *within* a group, because social identities are complex and multifaceted, they need not be. This insight from social identity theory can help explain why the behavior of states seeking to enter a higher status group may differ from the behavior of states in a group that is seeking to challenge the dominant position of another group, for example.[15] Variation in status seeking tactics may also depend on what kind of status a state is trying to achieve. If we accept that status is inherently social, we must also recognize the importance of the way that states relate to each other: their *roles*, not just their traits. It is possible that "role status" seeking is governed by a different logic - more risk averse in times of ascendance and risk averse in times of decline - than "trait status" seeking.[16]

Putting aside disagreements about the underlying logic, it is clear from a growing body of empirical work that status has important implications for international politics. Scholars have moved beyond the argument that status matters, towards a more nuanced understanding of when and how it matters. Writing about great power wars, Wohlforth asserts that status hierarchies are somewhat ambiguous, leaving room for states to be dissatisfied with their perceived position and what they think it should be. In turn, dissatisfaction drives con-

[13] Marina G Duque. "Recognizing International Status: A Relational Approach". en. In: *International Studies Quarterly* 62.3 (Sept. 2018), pp. 577–592.

[14] Dafoe, Renshon, and Huth, "Reputation and Status as Motives for War".

[15] Deborah Welch Larson and Alexei Shevchenko. "Status Seekers: Chinese and Russian Responses to U.S. Primacy". en. In: *International Security* 34.4 (Apr. 2010), pp. 63–95.

[16] Kai He and Huiyun Feng. "Role status and status-saving behaviour in world politics: the ASEAN case". en. In: *International Affairs* 98.2 (Mar. 2022), pp. 363–381.

flict. He connects potential for dissatisfaction with the structure of the international system and argues that multipolarity leads to more great power status conflict wars because no state is unambiguously at the top of the international hierarchy. In a social world, defeating a rival great power in war is one way to ascend to the top of the hierarchy.[17] This idea developed further into the more general concept of "status deficits." A deficit is the difference between a state's realized status and its expected status, which is influenced by the reference group the state uses to calculate its expectation. To rectify the discrepancy between expectations and reality, states engage in status seeking behavior, which is intended to improve or secure its status by altering the collective beliefs of others. One type of status seeking behavior is war, and this is easily operationalized as a dependent variable with MIDs data.[18]

An important point that emerges from a review of the literature on the effects of status seeking behavior is that war is not inevitable. There are many ways in which states can try to increase their status (many of them symbolic).[19] Larson analyzes the strategic interaction of China, India, and Russia through the lens of status and finds cooperation and competition, not war. Each of these three states, she argues, is dissatisfied with their status in the international system because of their historical identities as great powers. The formation of the BRICS coalition as a more institutionalized and formalized bloc of states reflects the fact that India, China, and Russia want to improve their status relative to the Western powers, especially the United States. The BRICS coalition contributes to each state's status in a unique way. Because it comprises states with some of the largest populations and fastest growing economies in the world, the creation of the bloc conferred status benefits to every member at the outset, even though they agreed to very little substantively at their first summit.[20] Renshon and Larson present two different approaches – emphasizing identity and

[17] William C. Wohlforth. "Unipolarity, Status Competition, and Great Power War". In: *World Politics* 61.1 (2009), pp. 28–57.

[18] Jonathan Renshon. "Status Deficits and War". en. In: *International Organization* 70.3 (2016), pp. 513–550.

[19] Larson and Shevchenko, "Status Seekers".

[20] Larson, "Status competition among Russia, India, and China in clubs".

role respectively – to understanding status seeking behavior. Since identity and role are co-constructive and mutually independent, a more holistic approach requires us to take both seriously.[21] Whatever tactics states employ to influence their status, status dissatisfaction can have far reaching unintended effects. In extreme cases, status dissatisfaction and aspiration may be "proximate causes" of systemic change in the international system.[22]

Further complicating the role of status is recognition that it is field specific. States may be perfectly content with their status in one arena, but dissatisfied and actively seeking to increase their status in another. Therefore, to understand status seeking, we should look to specific arenas of contentious international politics, like opt-outs of certain provisions of the EU charter.[23] If we accept that status concerns can take precedent within certain fields, then it is possible to rationalize behavior that seems costly and pointless if we assume that states seek to maximize only security and wealth. One example is the decision to invest heavily in putting humans on the moon before a rival or to send massive fleets on symbolic voyages of "exploration" which were, in reality, more like international parades intended to flaunt the wealth and technological prowess of 15th century China.[24]

[21] Emel Parlar Dal. "Status competition and rising powers in global governance: an introduction". en. In: *Contemporary Politics* 25.5 (Oct. 2019), pp. 499–511.

[22] Andrej Krickovic and Yuval Weber. "What Can Russia Teach Us about Change? Status-Seeking as a Catalyst for Transformation in International Politics". en. In: *International Studies Review* 20.2 (June 2018), pp. 292–300.

[23] Rebecca Adler-Nissen. "The Diplomacy of Opting out: A Bourdieudian Approach to National Integration Strategies". In: *Journal of Common Market Studies* 46.3 (June 2008), pp. 663–684.

[24] Paul Musgrave and Daniel H. Nexon. "Defending Hierarchy from the Moon to the Indian Ocean: Symbolic Capital and Political Dominance in Early Modern China and the Cold War". en. In: *International Organization* 72.3 (2018), pp. 591–626.

3 The Model

3.1 Players and Parameters

To formalize the puzzle, suppose we have the following players and parameters:

- The model includes two *players*: A and B
- A has a *type* c, distributed uniformly in $[0, 1]$, representing its *capacity*
- The crisis has *severity* $\theta_L = \theta$ or $\theta_H = \theta + \delta$, where $0 < \theta_L < \theta_H < 1$
- There is a .5 probability that the crisis severity is low (θ_L) and .5 probability that it is high (θ_H); I also refer to low and high severity crises as *challenges* and *catastrophes* respectively
- $\beta \in (0, 1)$ represents the relative value that A places on its *status* (i.e. B's belief about its capacity); assumed to be common knowledge

Informally, we have a state with a given capacity facing a crisis of unknown severity. A representative third party state has a belief about the crisis-facing state's capacity. This is a crude, but necessary, *approximation* of status. The extent to which the crisis-facing state cares about others' beliefs is common knowledge.

3.2 Path of Play

Begin by assuming that A observes its own capacity, c. A has two options when a crisis occurs: $notify$ or $suppress$. If A suppresses, then A successfully manages a mild crisis iff $c \geq \theta_L$ and severe crisis iff $c \geq \theta_H$. If A notifies, then the crisis is successfully managed, but

A incurs cost $\kappa \in (0, 1)$. If A successfully manages without help, then c remains hidden and B must update its belief about c. If A fails to manage or notifies, then c is revealed.

3.3 Payoffs

Suppose the value of successful crisis management is $s = 1$ and the value of failure is $s = 0$. Note that $\kappa < 1$ because the cost of notification is trivial relative to the value of successfully managing the crisis.Let μ be B's posterior belief about c. A's payoff is the sum of s, $\beta\mu$ (if suppression AND success) or βc (if notification OR failure), and $-\kappa$ (incurred if A notifies). B's payoff is trivial; we assume only that B updates its beliefs based on the outcome after A plays.

3.4 Equilibrium

Given this setup, we can divide the As into three broad "types": high (with $c > \theta_H$), low (with $c < \theta_L$) and intermediate (with $\theta_L < c < \theta_H$). Next, I will attempt to construct an equilibrium in which suppression is optimal for at least some type of A.

To construct such an equilibrium, we can consider each type's optimal strategy in turn. First, the low type:

- Suppose we have A with $c < \theta_L$
- This type of A will always fail without help and always succeed with it
- We can compare the expected payoff of $suppress$ and $notify$ to find A's optimal strategy:

$$\mathbb{E}(suppress|c < \theta_L) = \beta c$$

$$\mathbb{E}(notify|c < \theta_L) = 1 + \beta c - \kappa$$

- We assumed $\kappa \in (0, 1)$, so this type always prefers $notify$

Next, the intermediate type:

- Suppose we have A with $\theta_L < c < \theta_H$
- This type of A will successfully manage without help with probability .5 and will always succeed with help; in other words, it can *gamble*
- We can compare the expected payoff of $suppress$ and $notify$ to find A's optimal strategy:

$$\mathbb{E}(suppress|\theta_L < c < \theta_H) = .5(1 + \beta\mu) + .5\beta c$$
$$\mathbb{E}(notify|\theta_L < c < \theta_H) = 1 + \beta c - \kappa$$

- Comparing the expected payoffs and rearranging, we find that this type prefers to $suppress$ if:

$$c < \mu + \frac{2\kappa - 1}{\beta}$$

Finally, the high type:

- Suppose we have A with $\theta_H < c$
- This type of A will successfully manage with or without help
- We can compare the expected payoff of $suppress$ and $notify$ to find A's optimal strategy:

$$\mathbb{E}(suppress|\theta_H < c) = 1 + \beta\mu)$$

$$\mathbb{E}(notify|\theta_H < c) = 1 + \beta c - \kappa$$

- Comparing the expected payoffs and rearranging, we find that this type prefers to *suppress* if:

$$c < \mu + \frac{\kappa}{\beta}$$

Now that we have derived A's optimal strategy, we have to derive consistent beliefs that support this strategy in equilibrium. Because we assume that notification or failure reveal c, B updates its belief upon only when observing a successfully managed crisis. Success does not reveal the severity of the crisis, only that:

$$c \in [\theta, \mu + \frac{2\kappa - 1}{\beta}] \cup [\theta + \delta, \mu + \frac{\kappa}{\beta}]$$

.

We assumed that c is uniformly distributed, so the expectation of this posterior distribution will be a weighted sum of the expectation of two uniform intervals:

$$\mu = \left[\frac{\mu + \frac{2\kappa-1}{\beta} - \theta}{\mu + \frac{2\kappa-1}{\beta} - \theta + \mu + \frac{\kappa}{\beta} - \theta - \delta}\right]\left[\frac{\mu + \frac{2\kappa-1}{\beta} + \theta}{2}\right] + \left[\frac{\mu + \frac{\kappa}{\beta} - \theta - \delta}{\mu + \frac{2\kappa-1}{\beta} - \theta + \mu + \frac{\kappa}{\beta} - \theta - \delta}\right]\left[\frac{\mu + \frac{\kappa}{\beta} + \theta + \delta}{2}\right]$$

This can be simplified:

$$\mu = \theta + \frac{\delta}{2} \pm \frac{\sqrt{2(\frac{2\kappa-1}{\beta})^2 + 2(\frac{\kappa}{\beta})^2 - \delta^2}}{2}$$

Notice that this solution includes two unique values of μ. Both are consistent with A's strategy, implying the existence of multiple equilibria. For the purpose of analyzing comparative statics, I focus on just one of these equilibria.

3.5 Comparative Statics

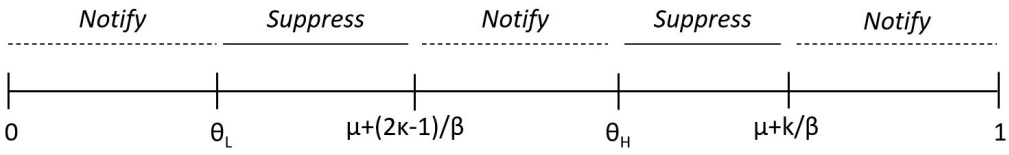
We can take the value of μ back into the intermediate and high type's cutoffs. Since we know that each will be indifferent between notify and suppress we find the intermediate type's cutoff is:

$$c = \theta + \frac{\delta}{2} + \frac{\sqrt{2(\frac{2\kappa-1}{\beta})^2 + 2(\frac{\kappa}{\beta})^2 - \delta^2}}{2} + \frac{2\kappa - 1}{\beta}$$

The high type's cutoff is:

$$c = \theta + \frac{\delta}{2} + \frac{\sqrt{2(\frac{2\kappa-1}{\beta})^2 + 2(\frac{\kappa}{\beta})^2 - \delta^2}}{2} + \frac{\kappa}{\beta}$$

This equilibrium result can be represented graphically like so:



What happens to the intervals where *suppress* is preferred as parameters change?

- As κ increases, the suppression intervals grow
- As δ increases, the suppression intervals grow
- As β increases, the suppression intervals shrink

Note that for this equilibrium to hold, the intervals represented in the graph must all be non-empty. First, consider what happens if the intermediate type's cutoff lies below θ_L. In this case, there are no intermediate types that prefer to suppress. Then there is only one interval in which suppress is optimal, and it lies entirely above θ_H. But, the midpoint of this interval must be above θ_H, so there must be some intermediate types who prefer to suppress. Next, consider what happens if the high type's cutoff for suppression lies below θ_H. In this

case, no high types prefer to suppress, so the suppression interval lies entirely below θ_H, so there is no pooling of high and intermediate types. Without some high types choosing to suppress, any benefit that intermediate types gain from the uncertainty about their capacity disappears.

4 Model Analysis

The equilibrium, summarized by the figure, implies a typology of states. Here is a description of the five categories:

1. **Low type**: these are states that know they will need assistance to manage a crisis of any severity. Because they have no chance of managing on their own, their best option is always to ask for help.

2. **Gambling intermediate type**: States that can manage low severity crises on their own, but would need assistance to manage catastrophes. Their incentive to suppress the crisis (and gamble that it turns out to be manageable) comes from the possibility of appearing like a high type. This is the most dangerous type from an international perspective.

3. **Honest intermediate type**: Like the gambling type, but with higher capacity. Because they have higher capacity, they benefit less from gambling than they do from acknowledging the crisis and managing it with help.

4. **Silent high type**: These states have enough capacity to manage a challenge or catastrophe without help. Because of the cost associated with acknowledging the crisis publicly, they prefer to stay silent and manage the crisis on their own. This is the type that the gambler can mimic by suppressing and successfully managing on their own. They are competent but prefer to fly under the radar.

5. **Honest high type**: These are the highest capacity states. Not only can they manage either type of crisis on their own, they are willing to bear the cost of publicizing the crisis to avoid being pooled with the gamblers and silent high types. In short, they are loud and proud.

This typology highlights the logic that can drive intermediate types to gamble and high types to suppress. Because they are being pooled with (i.e. appearing like) some intermediate types, the high types are sacrificing value along the dimension of B's posterior belief – they would be held in higher regard by B by revealing the crisis. Because they are able to manage the crisis either way, they gain nothing from the value of s. Therefore, in the absence of the cost κ, it would be optimal for all high types to suppress. But, if the cost is high enough that it compensates for other states believing their capacity is lower than it actually is, then the cost of notification drives these high types to suppress the crisis.

The logic for the gambling intermediate types is different because they do not suffer a loss in utility from pooling with high types; they benefit from a higher than actual belief in their capacity because some high types also suppress. Unlike the high types, they are not guaranteed to successfully manage the crisis on their own. By choosing to suppress, they sacrifice the certainty of successfully managing the crisis in the hope that they will be able to manage on their own and benefit from appearing like a high type to B. This is only optimal if the potential benefit along the belief dimension is sufficient to overcome the cost in expected utility in the crisis management dimension. Intuitively, this is why there is a cutoff *within* the intermediate type interval above which it is optimal to reveal. States closer to the upper limit of this interval benefit *relatively* less in terms of B's belief than those closer to the lower limit of this interval. As capacity increases within this interval, it is less likely that the benefit of pooling with the high type overcomes the cost of potentially failing to manage the crisis.

In the simplest terms, the core implication of the model is: when faced with a crisis of uncertain severity, an intermediate capacity state that cares about its status may choose to suppress the crisis and try to manage it on their own, in the hopes of mimicking a high-capacity state. These states are trying to *fake it 'til they make it.* The model also reveals the conditions under which this strategy will work; by extension is has implications for the conditions under which we might see this type of behavior.

Some of these implications are relatively straightforward, but others warrant more careful consideration. First, as δ grows, the range of values of c under which suppression is optimal also grows. In other words, as the difference in severity between challenges and catastrophes increases, the more intermediate types will be willing to gamble. This is quite intuitive: because B's posterior belief accounts for the possibility that A is a high type, a higher capacity cutoff for the high type category increases B's posterior belief. The increased status benefit is sufficient to induce more intermediate types to gamble.

Next, consider what happens as κ (the cost of reporting) increases. Recall that the cost is necessary for high types to prefer suppression to notification. In the absence of the cost, all high types would reveal to avoid the status cost of being pooled with some intermediate types. As this cost increases, the range of high types for which it is better to suppress increases (since they are guaranteed to manage the crisis successfully even without help). This pushes B's posterior belief up, which increases the expected payoff of gambling, incentivizing more of the intermediate types to suppress in the hope of mimicking a high type.

Finally, we have the β parameter, which represents the importance of reputation relative to crisis management to country A. The effect of β is the opposite of κ and δ: as it increases, the suppression interval shrinks. Why might this be the case? First, consider the perspective of the high type. Because they are guaranteed to manage any crisis on their own, that portion of the payoff is constant in the decision to notify or suppress. As reputation concerns become more acute, the cost of being pooled with the intermediate type (in the

reputation dimension) increases. For high types who are further from the intermediate/high type cutoff, avoiding the cost of notifying is no longer sufficient to overcome the status loss. In turn, B's posterior belief decreases to reflect the smaller high-type suppression interval. That means there will be fewer intermediate types who are willing to bear the expected loss of utility incurred by gambling.

5 Case Studies: A Tale of Two Meltdowns

First, it is important to recognize the limitations of the model. Recall that the motivation to formalize the scenario laid out in the introduction was to see if there is an equilibrium in which suppression is a rational response to crisis. For that to be the case for intermediate capacity states, as a tactic to increase status in a particular field of international politics. While the model generates a typology, I would not argue that it is going to perfectly predict states' behavior in a crisis. A better interpretation of the model's implications is that if the following conditions hold:

1. States care about their status in a particular field of international politics
2. A crisis begins to emerge within a state and within the field of politics
3. The severity of an emerging crisis is uncertain
4. Asking for help to manage a crisis is costly

Then the decision to suppress the crisis can be rationalized. The model does not account for other considerations that may influence the decision to report the crisis, like international treaty commitments. Also recall that (according to the model) states' types and crisis severity are not observable. The model's logic would fall apart if they were. Trying to test the plausibility of the model against a general empirical trend is going to be very challenging,

since we can never observe the counterfactual world in which a state is assigned higher or lower capacity to see if it influences their strategy.

I try to test the model's core logic against two cases. To avoid confirming my reasoning by analyzing the crisis that motivated the model, I turn to a different type of crisis: emergencies at nuclear power plants. The first civilian nuclear power plant went online in Obninsk in the Soviet Union on June 26, 1954.[25] Since then, three major incidents have become lodged in the popular imagination as emblematic of the dangers of nuclear power: Three Mile Island, Chernobyl, and Fukushima. To assess the plausibility and explanatory power of the theory, I focus on the first two. Just months following the Chernobyl incident, new international agreements setting clear standards for reporting nuclear accidents to the IAEA and requesting international assistance were adopted outlining clear expectations for reporting nuclear emergencies and procedures for requesting and providing assistance.[26][27] This altered the international legal framework governing response to this type of crisis, so comparing incidents before and after September 1986 is more challenging. The fact that the Three Mile Island and Chernobyl incidents occurred in competing Cold War superpowers makes them a good pair of cases to test the model. Locked in geopolitical competition against each other, the US and USSR faced similar incentives; their responses to their respective crises diverged sharply.

Despite often being linked in the popular imagination, the causes and consequences of the meltdowns at Three Mile Island and Chernobyl were drastically different. I show that the model above provides a helpful way of understanding why the rival superpowers chose different strategies in the face of their respective crises. I will first discuss Three Mile Island. It occurred earlier and the public response influenced the conditions in which Soviet leaders

[25] "Atom Mirny: The World's First Civilian Nuclear Power Plant". In: *IAEA Bulletin* 54.4 (Dec. 2013), pp. 5–7.

[26] *Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency*. English. Sept. 1986.

[27] *Convention on Early Notification of a Nuclear Accident*. English. Sept. 1986.

were forced to respond to their own reactor crises. I will draw on a combination of official reports and historical accounts of the crises to highlight the differences in their response. Finally, I will highlight the international response to the Chernobyl incident as evidence that the international community recognized the need to address the conditions that can lead to crisis suppression.

The Soviet Union connected a nuclear power plant to the civilian electrical grid before the United States, but by the mid 1970's the United States was the largest exporter of nuclear reactors. In terms of the model, this suggests that the US already had the highest possible status in nuclear power, so they should react like an *honest high-type*. When faced with a nuclear crisis, I would expect them to be forthcoming, even though they had the ability to manage the crisis on their own and to keep it well hidden. The US was trying to maintain strict nonproliferation standards, but other exporters were more blasé about selling the technology, leading to a heated debate within Gerald Ford's administration about whether the US government was harming its own interests by playing up the dangers of nuclear accidents and pollution from commercial nuclear power plants.[28]

On the other hand, the Soviet Union was attempting to break into the nuclear technology export market. As will be discussed in detail below, the Soviet nuclear agency knew that their reactor design was susceptible to failure. We now know that the Soviets had some capacity to manage minor crises, because in he aftermath of Chernobyl, it was revealed that they had several less severe crises at their nuclear plants in the years leading up to the catastrophe. The relative capacity of their nuclear sector was sufficient to place them in the *intermediate* type interval, but was plagued by enough problems that they were likely on the lower end, and fall within the *gambling intermediate type* interval. According to the model, we would expect them to try to cover up a crisis and attempt to manage it without help to increase their relative status within the hierarchy of nuclear powers.

[28] James Reston. "The Nuclear Power Race". In: *New York Times* (June 1975), p. 39.

5.1 Three Mile Island

The emergency at the Three Mile Island (TMI) nuclear power plant began around 4 am on Wednesday, March 28, 1979. Though there have been minor "mishaps" in this particular reactor's first year of operation, crews were able to keep it running relatively smoothly and it was operating at approximately 97% capacity when the emergency began.[29] Shortly after alarms began sounding in the control room and two loud bangs rocked the turbine building, the reactor's built in safety systems began a "trip" - an automatic shutdown.[30]

When a reactor trip began, the valves feeding steam to the turbines closed. This meant that the turbines no longer drew heat away from the coolant system, so the coolant water rapidly heated and expanded. To account for this possibility, the primary coolant system had a built in pressure relief valve (PORV), which was designed to open automatically to allow steam to escape and bring the temperature in the coolant loop back down. Simultaneously, the reactor automatically "scrammed" (i.e. slowed the reaction by inserting graphite into the coolant). In an ideal world, the coolant loop begins to cool and the pressure in the system drops back to acceptable levels. This is supposed to allow the pressure relief valve to close, and the TMI operators assumed that it did. Unfortunately, it would take nearly two hours for them to correctly identify that the valve was stuck open, allowing approximately 220 gallons of water to escape the coolant loop *per minute*. This resulted in a rapid and significant drop in pressure: approximately 25% within two minutes.[31] This is when the real disaster began.

When the pressure dropped below a certain level, the high pressure injection (HPI) system began pumping water into the reactor core to ensure it remained covered. This system worked exactly as designed, and had the operators simply let the automated safety

[29] Mitchell Rogovin and George T. Frampton Jr. *Three Mile Island: A Report to the Commissioners and to the Public*. Special Inquiry Group NUREGCR-1250V1. Nuclear Regulatory Commission, Jan. 1980, p.7.
[30] Rogovin and Frampton Jr., op. cit., p.14.
[31] Rogovin and Frampton Jr., op. cit., p.14.

features run their course, the core meltdown may have been averted entirely. Unfortunately, it was not clear from the control room that the PORV was stuck open, so the only clear signal of the amount of water in the coolant loop was the pressurizer water level, which continued to rise. This concerned the operators who are taught to prevent the reactor from "going solid" above all else. A solid reactor (i.e. one that is completely full of water) limits operators' ability to regulate the reactor's pressure. The combination of low pressure and high water levels in the pressurizer confused the operators, and led to a critical error. Because they did not realize that coolant was gushing out of the PORV, they assumed that the coolant loop was saturated with water. To prevent the system from "going solid," they overrode the HPI and drastically reduced the flow rate. Unfortunately the rate at which water was entering the coolant loop was dwarfed by the rate at which coolant was escaping from the open PORV.[32]

An hour after the reactor tripped, the containment building, which houses the reactor core and primary coolant loop, showed increased pressure and temperature readings. Shortly after 5 am, operators were startled when the chain reaction restarted; it should have been impossible with all control rods fully engaged from the emergency scram. At this point, there was substantial steam buildup throughout the coolant loop. When the operators shut off the main pumps to prevent damage (they had begun to vibrate violently), the steam and water separated. With no circulation, pressure still low, and the reaction underway again, the coolant quickly boiled away. Within 30 minutes, the fuel rods were more than halfway uncovered. Fortunately, around 6 am, a shift supervisor who had just arrived on site recognizes from the strange combination of low system pressure and high temperatures in the containment building that there was steam in the loop causing the artificially high pressurizer water level and that the PORV must be leaking. He immediately ordered it closed, effectively stopping the meltdown in its tracks.[33]

[32]Rogovin and Frampton Jr., op. cit., p.15-17.
[33]Rogovin and Frampton Jr., op. cit., p.18-19.

At the time, nobody in the plant realized that the core had begun to melt down. One of the NRC's conclusions in the weeks and months following the accident is that if the PORV had not been closed, then a full core meltdown was likely. But, it is a testament to the safety of American reactor design that all the various technical analyses performed in the wake of the accident agreed that there was minimal risk of harm to public health and safety, *even in the event of a complete meltdown.* If the core had fully melted down, almost all the radioactive material released by the melted fuel would have remained in the containment building. Experts predicted that the containment structure would have worked exactly as intended.[34]

At the time though, nobody at the plant realized the extent of the damage to the core. Even though the nightmare scenario had been averted already, the operators only began to understand the extent of the damage when radiation readings in the containment building started going up.[35] Increased radiation readings trigger a general plant emergency. As soon as an emergency was declared at 7am, the shift supervisor began making calls to notify everyone on a predetermined list. This included the Pennsylvania Emergency Management Authority (PEMA), NRC regional office, the president of Met Ed (the utility company operating the plant), the Met Ed public information office, and a few other key individuals.[36] Someone in the control room notified the state police, who positioned officers at key points to control traffic in the event of an evacuation. In the process, the police inadvertently tipped off the public - a traffic reporter from nearby Harrisburg with a police radio picked up on the emergency at the plant and called in the tip to an editor. Another local reporter picked up the tip in a call with the state police a few minutes later and notified the Associated Press. By 9 am, less than 6 hours after the ordeal began, the news of a general emergency at the plant reached the national wire. The news traveled so quickly that the mayor of Harrisburg, the town closest to the plant, learned of the emergency when a reporter called to ask for

[34]Rogovin and Frampton Jr., op. cit., p.20.
[35]Rogovin and Frampton Jr., op. cit., p.21.
[36]Rogovin and Frampton Jr., op. cit., p.27.

comment.[37]

In the first public statement since the incident began, Met Ed's spokesperson delivered what little information he had. While he knew that there had been slightly elevated off-site radiation readings near the plant, the statement said that, "there have been no recordings of any *significant* levels of radiation, and none are expected outside the plant."[38] While technically true, reporters had observed a release of steam from the plant and were already suspicious that the utility was trying to hide the reality of the situation. The Pennsylvania governor's office added to the skepticism later in the day, when the Lt. Governor stated publicly that Met Ed had not notified the state of the steam release and that regulators (incorrectly) believed the steam to be radioactive.[39] Rather than suppressing information, the government engaged in speculation, fueling panic among the general public.

The following morning, miscommunication between regulators, the media, and the public reached a new peak. NBC's Tom Brokaw told his viewers that radiation was penetrating the (four feet thick) concrete walls of the containment building and was detected 16 miles from the plant, which was objectively false.[40] On the other hand, Met Ed held heir first public press conference at 10 am Thursday and projected a subdued confidence that the incident was over and there was no ongoing danger to the general public. The utility acknowledged that there were trace amounts of radioactive material leaking from the plant via pathways deemed necessary to continue the process of shutting down the reactor.[41] But late on Thursday night, operators at the plant realized that the danger was not over. A sample of coolant water indicated a far larger release of radioactive material than previously thought. Around the same time, it was determined that there was a sizable non-condensible gas bubble in the coolant system, which made the prospect of fully shutting down the reactor more difficult

[37] Rogovin and Frampton Jr., op. cit., p.29.
[38] Rogovin and Frampton Jr., op. cit., p.44.
[39] Rogovin and Frampton Jr., op. cit., p.44.
[40] Rogovin and Frampton Jr., op. cit., p.48.
[41] Rogovin and Frampton Jr., op. cit., p.54.

and raised fears of a hydrogen explosion.[42]

Early on Friday morning, concern about the gas bubble reached a fever pitch and with pressure in the system rising, operators decided a release of some radioactive steam was a necessary evil. To ensure the releases did not become hazardous to people in the surrounding area, a helicopter was dispatched to monitor radioactivity directly above the stack.[43] Through a series of communications mishaps and unfortunate coincidences, the NRC interpreted the reading from directly above the stack (i.e. where the highest concentration of radiation would be expected) as an offsite, ground-level reading. They quickly decided that an evacuation was prudent. They immediately communicated their recommendation to PEMA, around 9:15am. Once PEMA set its evacuation preparation plan in motion, the public quickly became aware of the impending order and pandemonium began.[44] The governor's office, who would have to be the one to formally order an evacuation did not know about the NRC's advice until after it had made its way to the public. By this point, the NRC had realized their error interpreting the radiation reading from above the stack and became convinced that no evacuation was necessary. The governor concurred and shortly after 10am, the recommendation to evacuate was rescinded. To try to assuage the concerns of the public, the governor spoke live on the radio around 10:25am.[45] But, the damage was done; full scale panic had set in throughout the region and many people decided to leave anyways. Advice from the governor, NRC, and media was largely falling on deaf ears.

The Carter administration had not been actively involved in managing the crisis up to that point. They had largely stood aside and let Met Ed, PEMA, and the Pennsylvania Governor's office manage it. But after the confusion and panic of Friday morning, President Carter decided that at the very least, he needed a more direct source of information than the NRC was providing (especially given the role they played in the premature evacuation

[42]Rogovin and Frampton Jr., op. cit., p.58.
[43]Rogovin and Frampton Jr., op. cit., p.60-61.
[44]Rogovin and Frampton Jr., op. cit., p.62-64.
[45]Rogovin and Frampton Jr., op. cit., p.65-66.

order). The White House decided to send Harold Denton, a senior staff member at the NRC.[46] Reflecting on the experience nearly 30 years later during a congressional hearing on the NRC, Denton expressed his surprise at being assigned the task. He was not a trained spokesperson, but he made an important realization: the technical experts were providing too much detail and not enough context in their reports on the plant's condition and the utility's actions, while elected officials were not providing enough detail in their calls for calm. By translating the technical details that were encouraging the experts, he was able to more effectively communicate to the public *why* they should believe the (seemingly) rosier picture being painted by elected officials.[47]

The final big scare of the episode occurred on Saturday afternoon. After becoming convinced of the possibility of a hydrogen explosion, NRC Commissioner Hendrie decided to express his fear in a press conference. It was pure speculation: Met Ed and the NRC had been monitoring the hydrogen bubble and already determined that the lack of oxygen rendered an explosion impossible. Indeed, they had already said as much publicly. Nevertheless, the hypothetical hydrogen explosion spent all day circulating in the rumor mill and by the evening, the Associated Press presented it as an impending calamity. After catching wind of the erroneous reports, the governor and the utility publicly reiterated that they were confident no explosion was coming. To back up their confidence, they decided to invite President Carter to the plant. Despite the concern of some advisors, he agreed. He arrived on Sunday afternoon and toured the plant, accompanied by the First Lady, Governor Thornburgh, and Harold Denton. After visiting the control room of TMI unit 2, he addressed the public in nearby Middletown. He assured them that the reactor was stable, but if the situation changed, they may be advised to take further precautions.[48] Fortunately, the situation was firmly under control; government and the media pivoted to examining what

[46] Rogovin and Frampton Jr., op. cit., p.68.
[47] Barbara Boxer et al. *Three Mile Island - Looking Back on 30 Years of Lessons Learned.* en. Mar. 2009.
[48] Rogovin and Frampton Jr., *Three Mile Island: A Report to the Commissioners and to the Public*, ch.16-17.

went wrong and how to prevent it from happening again.

There is no doubt that even though the worst case scenario did not come to pass, the debate about nuclear power fundamentally shifted in the wake of TMI. A combination of unfortunate mechanical flukes and operator miscommunication led to what remains the worst nuclear incident in American history. In accordance with the emergency response plan, the plant's operators alerted local and federal regulators, administrators, and emergency personnel as soon as possible. The plant's built in safety features worked to minimize the amount of radioactive material that was released initially, but the meltdown contaminated such a large amount of steam and wastewater that some had to be released as containment tanks reached capacity (raising fears of an explosion). Fortunately, staff at the plant relieved pressure on the coolant system without raising atmospheric radiation to dangerous levels, and no official evacuation order was ever issued.[49] Even though no causal link between the radiation released during the emergency and adverse health effects has never been established, the incident was hugely embarrassing for the United States. The biggest mistake that authorities made though was arguably allowing *too much* information to reach the public before it could be verified. With so many different players involved (often speaking to the media simultaneously) the lack of clear lines of communication between them and coordination led to a lot of outright misinformation and highly technical details that calmed experts, but confused and frightened non-experts.

In line with the assumption of the model that status seeking affects states' response to crises, there is evidence that the Soviets saw TMI as an opportunity to claim . In written testimony to the Senate Subcommittee on Clean Air and Nuclear Safety in 2009, former Governor Thornburgh recalled visiting leaders in the Soviet nuclear industry in Moscow less than eight months after TMI. The Soviet contingent apparently told the American delegation that they considered nuclear safety a "solved issue." While it would take several years, it

[49] John Kemeny. *Report of the Commission on The Accident at Three Mile Island—The Need For Change: The Legacy of TMI.* Presidential Commission Report. Washington, DC, Oct. 1979.

eventually became clear that the Soviets had not solved the issue of nuclear safety and they would have been better served trying to learn from the American experience than dismissing it as overly dramatic.[50]

5.2 Chernobyl

The most famous incident at the Chernobyl power plant took place in April of 1986 and involved Unit 4, the newest of the four 1000 megawatt reactors. It was by far the most severe incident, but it was not the first crisis to affect one of the plant's reactors. In September 1982, Unit 1 at Chernobyl suffered a partial meltdown. The initial intelligence reports from KGB officers in Kiev reported that there was not significant radioactive contamination.[51] This initial assessment turned out to be incorrect: radioactive contaminants were carried as far as 14 kilometers from the plant. While there were no deaths attributed directly to this incident, it took 8 months to repair the damage to the reactor. Also notable was the coverup: the cleanup and repairs were done discreetly, KGB agents forced those with direct knowledge of the incident to sign gag orders, and the whole affair was classified as top secret.[52]

The incident and coverup are unsurprising given the troubled history of RBMK style reactors. In their quest to scale nuclear power quickly and cheaply, the Soviet government commissioned mass production of the reactors despite never constructing a working prototype. Even though the reactor cores were massive relative to Western reactors (twenty *times* larger than the typical western reactor core in use at the time), they lacked vital safety measures. The cores were not housed within containment units, were difficult to monitor during periods of low power (like startup and shutdown, when the reaction was most likely to run

[50] Boxer et al., *Three Mile Island - Looking Back on 30 Years of Lessons Learned*, p.118-119.

[51] Vakuylenko. *Report of KGB's Governance about the Emergency Stop of Chernobyl Nuclear Power Plant Unit No.1 on 9 September 1982*. Russian. Backup Publisher: Woodrow Wilson International Center for Scholars. Sept. 1982.

[52] Adam Higginbotham. *Midnight in Chernobyl: the untold story of the world's greatest nuclear disaster*. First Simon & Schuster hardcover edition, ebook. OCLC: on1083671410. New York: Simon & Schuster, 2019, ch. 4.

out of control), and the emergency shutdown mechanism was designed to work gradually rather than suddenly to avoid disruptions to the electrical grid. The Soviet reactor design agency, NIKIET, was aware of these and other flaws before the first RBMK reactor went critical. After they began operating the reactors, even more flaws revealed themselves. In 1975, the first operational RBMK reactor suffered a partial meltdown while it was being restarted after routine maintenance. In October 1982, an RBMK reactor in Armenia exploded. Less than three years later, 14 plant workers were killed when a relief valve ruptured and released a burst of superheated steam. Each incident was covered up by the Soviets, to the point that even operators at other plants were unaware of the incidents. Various agencies and commissions were aware of the risk of catastrophic failure, but their findings were routinely classified and recommendations generally ignored.[53]

This historical background is helpful to establish that there was uncertainty about the severity of an emerging crisis. The Soviets had already suppressed and (arguably) successfully managed challenges at RBMK reactors on several occasions. But, the reactor's designers knew about the flaw that most directly contributed to the explosion in Chernobyl Unit 4. The chief engineer of the RBMK design tried to make plant operators aware of the issue, but recommended changes to the reactor and operating manuals were not implemented.[54] Despite their past success, it is implausible that Soviet authorities were not aware of the extant threat of catastrophic failure of an RBMK reactor and suppressing each successive crisis was a gamble. They were lucky that they were able to manage the first several, but their luck ran out in April 1986.

In the early morning hours of April 26, 1986, the operators of Chernobyl Unit Four were preparing to test a new safety system that was intended to manage a reactor shutdown in the event of a total loss of external power. Before the test even began, the operators

[53] Higginbotham, op. cit., ch. 4.

[54] *The Chernobyl Accident: Updating of INSAG-1.* Safety Report 75-INSAG-7. Vienna: International Nuclear Safety Advisory Group, International Atomic Energy Agency, 1992, p. 13.

were having trouble controlling the notoriously finicky reactor. Despite protests from his subordinates, the chief engineer ordered the test carried out at much lower power than the protocols indicated was safe. This unfortunate error allowed a dangerous feedback loop to begin within the reactor and by the time the operators realized the danger and tried to shut down the reactor, it was too late for the emergency shutdown mechanism to halt the runaway reaction. Highly flammable gases and pressure built up in the reactor exponentially, culminating in an explosion equivalent to sixty metric tons of TNT.[55]

Local emergency crews got to work almost immediately, trying to suppress the fire, which was spewing radioactive material into the night sky. Word of the crisis worked its way quickly up the chain of command in the Ministry of Energy and Ministry of Defense, but throughout the morning of April 26, the plant's director presented an overly rosy picture to the Kremlin. He assured party leaders that the crisis was under control, which was untrue. The true extent of the radiological contamination came into sharp relief later in the day, prompting some Ukrainian officials to call for an evacuation. The head of the Kremlin's response team, Boris Scherbina, disagreed. When he spoke with General Secretary Gorbachev in the evening of April 26, he maintained that the crisis would be handled and the reactor (which had been obliterated) would be online promptly. Ukraine's energy minister Vitali Sklyarov expressed his belief that an evacuation was necessary on a call with Vladimir Scherbitsky, the head of Ukraine's Communist Party, prompting Scherbina to exclaim that they would be humiliated in front of the whole world.[56]

While emergency crews raced to contain the fire and prevent additional explosions and Ukrainian leaders argued for an evacuation of Pripyat, the KGB and military were busy sealing off the city. Evidence of a catastrophic release of radiation continued to mount. Not only were instruments above the plant and closer to the center of the city revealing dangerously high levels of radiation, people who had been at the plant at the time of the

[55]Higginbotham, *Midnight in Chernobyl*, ch. 5.
[56]Higginbotham, op. cit., ch. 7.

explosion began to show signs of radiation poisoning. Knowing that it would become harder and harder to contain the news as casualties from the blast and acute radiation poisoning piled up, the city was effectively sealed off. Roadblocks prevented anyone but Soviet officials from going in or out; telephone lines were cut to prevent communication between Pripyat and the outside world.[57]

The evacuation was finally approved by authorities in Moscow in the afternoon of April 27, nearly two full days since the incident at the power plant.[58] Despite murmurings of a serious problem at the plant, life in Pripyat went on as usual for most residents in the 36 hours between the explosion at the plant and the beginning of the evacuation. Even as they boarded the buses that would shuttle them to nearby towns and villages, most residents were under the impression that they would return home within a few days. Few could have imagined they were leaving their homes for the last time.[59] Despite the mass relocation, the Soviets refused to publicly acknowledge the ongoing crisis at Chernobyl, or the threat that it posed; even Ukrainian media was bereft of coverage of the accident.[60] Unfortunately for the Soviets, a westward wind prevented them from completely suppressing this nuclear crisis as they had done several times before.

The sheer volume of radiation that was released by the Chernobyl incident was so high that it triggered alarms and prompted nuclear plant evacuations in Sweden, 1200 kilometers away, early on April 28. The Swedish government tried to get information privately from Soviet authorities. Receiving none, they began to make vague statements about norms and agreements regarding incidents of radioactive material releases. Realizing that they could not deny the crisis for much longer, the Soviet media acknowledged the incident for the first time on the evening of the April 28 but provided few details and claimed that the situation

[57] Higginbotham, op. cit., ch. 8.
[58] Serhii Plokhy. *Chernobyl: the history of a nuclear catastrophe.* First edition. New York: Basic Books, 2018, p. 151.
[59] Plokhy, op. cit., pp. 152–4.
[60] Plokhy, op. cit., p. 173.

was under control.[61] President Ronald Reagan first learned about the incident on April 29. The administration's initial public response was to offer assistance to help manage the crisis. When they refused, the State Department publicly admonished the Soviets for withholding information about the incident. The next day, on April 30, Gorbachev sent word to Reagan that an incident had occurred and the area immediately surrounding the plant had been evacuated but downplayed the extent of the ongoing crisis.[62]

Despite Soviet insistence that the crisis was under control, American intelligence suggested otherwise. The public rhetoric heated up throughout the first week of May. While Reagan continued to publicly offer assistance, he also became more openly critical of the Soviet refusal to disclose what they knew about the situation and the ongoing risk that it posed.[63] Despite public claims that they did not need assistance and had the crisis under control, the reality on the ground was quite different. The Soviets worked around the clock to dump as many absorbents – sand, clay, dolomite, and lead – as possible into the reactor to stop the meltdown. At the peak of the operation, they were dumping 1500 metric tons of material from helicopters per day. Initially, it seemed to work: the core temperature was dropping. After a few days, the temperature in the core began to rise sharply, raising fears that the core was finally suffering a complete meltdown. If that was the case, then it was possible that the molten material would burn through the bottom of the vault and flow like lava into the earth below. This made two nightmare scenarios possible:

1. If the molten core reached the water table, it would contaminate the water table that supplied approximately thirty million people in Ukraine and ultimately flowed into the Black Sea;

2. If the molten core hit water in the sealed compartments below Unit 4, it could cause a steam explosion many times more powerful than the initial one, threatening to destroy

[61] Plokhy, op. cit., pp. 175–6.
[62] Plokhy, op. cit., p. 180.
[63] Higginbotham, *Midnight in Chernobyl*, ch. 12.

the remaining intact reactors.[64]

Soviet authorities continued to walk a delicate tightrope. On the one hand, they tried to project confidence that they had the situation under control. On the other hand, they were busy evacuating people and livestock within a thirty kilometer radius of the plant, all while knowing that an even bigger catastrophe was on the horizon.[65] Eventually the melting core did begin to cool again, and by the time Western officials with the IAEA were granted access to the site, the risk of further calamity had passed. But this was not until May 8, nearly two weeks after the initial incident. On May 11, the first television broadcast from inside the exclusion zone included a triumphant interview with the acting head of the government's Chernobyl task force. Not only did he claim victory in averting the worst case scenario in the crisis, he accused the "bourgeois newspapers in the West" of overstating the threat of further disaster.[66] Whether or not the worst-case was averted is a matter of perspective: even if it could have been worse, Chernobyl is the worst nuclear accident in history. 50 people were killed by acute radiation sickness during or shortly after the incident. 4000 cases of childhood thyroid cancer were attributed to radiological contamination of milk and other foods, resulting in 15 deaths. Radiation exposure during the incident may eventually result in as many as 4000 deaths. 800,000 hectares of agricultural land and 700,000 hectares of forest used for timber production had to be removed from service. 340,000 people were eventually evacuated, many of them permanently.[67]

[64] Higginbotham, op. cit., ch. 11.
[65] Plokhy, *Chernobyl*, pp. 198–202.
[66] Higginbotham, *Midnight in Chernobyl*, ch. 12.
[67] Mohamed ElBaradei. "The Enduring Lessons of Chernobyl". In: Vienna: International Atomic Energy Agency, Sept. 2005, pp. 3–7, p. 4.

5.3 Returning to the Model

To put the two cases in the language of the model: the Soviet response to Chernobyl was suppression and the American response to Three Mile Island was notification. This is obviously an oversimplification. The media in the US expressed displeasure with the lack of specificity and consistency in communications from the utility operator and regulators responsible for Three Mile Island. But, the media were made aware of the incident within hours and were not prevented from reporting on it or visiting the site. President Carter publicized his visit to the site within a few days of the accident. While many people in the communities near Three Mile Island were frustrated by the often confusing messages coming from various sources, there was arguably too *much* information making its way to the public, not too *little*. The presidential commission tasked with the investigation makes no mention of intentional cover-up or suppression of the severity of the crisis in their report.[68]

Contrast this with the Soviet response to the Chernobyl accident. Residents of Pripyat were prevented from leaving or communicating with anyone outside the city even as radiation levels reached dangerous levels. It was not until the accident was detected by a foreign government that the Soviets publicly acknowledged the crisis (even to their own population). Their suppression arguably continued through the initial IAEA investigation: the first report placed almost all of the blame on the shoulders of the operators and their failure to follow protocols, downplaying fundamental flaws in the reactor design.[69] The IAEA apparently thought the Soviet characterization of the causes of the accident was misleading enough that they issued an updated report in 1992 to correct the historical record.[70]

According to the model, notification is rational for low-types who will definitely fail to

[68] Kemeny, *Report of the Commission on The Accident at Three Mile Island—The Need For Change: The Legacy of TMI*.

[69] *Summary Report on the Post-Accident Review Meeting on the Chernobyl Accident*. Safety Report 75-INSAG-1. Vienna: International Nuclear Safety Advisory Group, International Atomic Energy Agency, 1986.

[70] *The Chernobyl Accident: Updating of INSAG-1*.

manage the crisis without help, intermediate types who have high enough capacity that they would rather ask for help and reveal their capacity and gamble, and high types whose capacity is high enough that they are willing to bear the cost of notification. Because they successfully managed the crisis – there were no casualties at the plant and the radiation that escaped the plant had no detectable long term adverse impacts – we know the United States was not the low type. I would contend that they were the honest high-type. As the global leader in reactor technology at the time, the United States had little to fear by revealing the crisis. If anything, it showed that the safety systems in place at American reactors worked well to protect the public in the event of an emergency. There was a cost to publicizing the crisis: the anti-nuclear movement picked up steam and demand for new plants began to dwindle. As the world's largest exporter of the technology, this was not a desirable outcome. Despite these costs, the US chose to notify the world of the crisis anyways.

Suppression is optimal for high types that would rather fly under the radar and for intermediate types that are willing to gamble. The outcome of the crisis – undeniable catastrophe – reveals that the USSR was not the silent high type. So, the USSR must have been the gambling low type, and the evidence supports this. By 1986, they had already suppressed several nuclear crises successfully, and believed that they could do so again. The US had been publicly embarrassed by the incident at Three Mile Island, and continuing to keep Soviet designed, manufactured, and operated reactors online without incident helped the Soviets challenge the US position atop the nuclear technology hierarchy. Any serious incident at a Soviet reactor would have the opposite effect. In terms of the model results, their capacity and desire to convince the world that their technology was on par with American technology pushed them to gamble. Unfortunately for all involved – especially Chernobyl's operators and the civilians harmed by the fallout – the gambit backfired.

6 Conclusion and Future Research Directions

Using a model of crisis response, I have demonstrated that status conscious states may be better off suppressing a crisis than asking for (or accepting) outside help. External uncertainty about the severity of a successfully managed crisis provides an opportunity for states lower in the hierarchy to mimic those ahead of them in the hierarchy. Unfortunately this individually rational behavior can turn out to be socially harmful. The case of Chernobyl is an excellent example. In their quest to hide the deficiencies of their nuclear reactors and regulatory safeguards, the Soviets covered up the crisis, even though the United States offered assistance and the situation continued to deteriorate. This decision ultimately backfired, but given the intense Cold War competition and the Soviets' desire to sell their reactors, they were willing to risk catastrophe in the hope of appearing more competent than they were.

There are several alterations and extensions that could be made to the model to further explore the relationship between reputation concerns and crisis management. One possibility is to relax the assumption that failure to manage the crisis perfectly reveals A's capacity. One immediate implication of this change is that the low-types' decision to suppress or notify is no longer trivial. In the current formulation of the model, this assumption ensures that all of the low types will notify (because they fail to manage crises with certainty). But, if this assumption no longer holds, then state B's posterior belief must also account for the possibility that A is a low type, which would bring the posterior belief down on average. Intuitively, we might expect that this would lead to unraveling of pooling equilibria like the one discussed above. Much like sellers of high quality used cars stay out of the market because of the presence of lemons and the inability of buyers to distinguish the two, it might turn out to be optimal for all high types to reveal to avoid being confused for low types.[71] Without high types to mimic, the intermediate types might choose to reveal in turn to

[71] George Akerlof. "The Market for "Lemons": Quality Uncertainty and the Market Mechanism". In: *The Quarterly Journal of Economics* 84.3 (1970), pp. 488–500.

avoid being confused for low types, leaving only the low types suppressing. But, with no intermediate or high types to mimic, they would have no incentive to suppress. Additional analysis is needed to determine if this is the result of relaxing this assumption.

Another possible change to make to the model is to parameterize the probability that the crisis is severe or not. The assumption that the crisis is equally likely to be severe as mild makes the algebra significantly less complicated and the statics easier to analyze. In reality, different types of crises might have drastically different probabilities of being catastrophic. For example, new viruses and variants emerge all the time, but very few become pandemics, and even fewer become as widespread or deadly as Covid-19. The prevalence of catastrophe from crises at nuclear power plants might be higher. What is considered a catastrophe versus a challenge depends on context and must be arbitrary to some extent. Nevertheless, parameterizing this variable would enable comparison between different types of crises in which the base rate of catastrophe is lower or higher. Intuitively, a higher probability of severe crisis would shrink the intermediate type's suppression region because they forfeit more of the payoff of successful crisis management, in expectation, by suppressing. More formal analysis may confirm this intuition or reveal a surprising interaction among existing parameters and the probability of catastrophe.

There also remains the possibility of a quantitative evaluation of the theoretical argument. While case studies are helpful in establishing that the mechanism is a plausible explanation for observed behavior, quantitative analysis could elucidate the plausibility of the typology. One possibility is to collect data on public requests for international aid in the wake of natural disasters. There may be relatively less uncertainty about the severity of the crisis than there is with novel infectious diseases or nuclear accidents, but as long as there is some uncertainty about the state's ability to manage the crisis on its own, then the model is still applicable. "Capacity" is a vague term and states may be high capacity in some sense but low capacity in other. In the case of natural disaster response, the relevant capacity

is the resources and personnel that a state can deploy on short notice to provide essential services to those impacted by the disaster. I have been unable to find a cross-national index or ranking of natural disaster preparedness, so I would need to identify a reasonable proxy for preparedness. Assuming that this is possible, it would be interesting to test the theory against a dataset that catalogs time between a natural disaster and public appeals for aid. This might lend itself well to a proportional hazards model, similar to Worsnop's approach to disease outbreak reporting.[72]

[72] Worsnop, "Concealing Disease".

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