Role of News Media in Cheap Talk Society

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1. Cheap Talk News Media and Decision Making Regarding Critical Issues

News as an information good has been altered in its characteristics. Receivers of news may consume it as entertainment; consequently, news products may be wholly or partially subject to emotional factors, leading to the exaggeration or omission of details reported.[1)] Further, fake news tends to be disguised as unbiased. When news receivers perceive a lack of legitimacy, they deem the information as manipulated or filtered. The *cheap talk* literature has analysed such incidents.[2)] In particular, studies have examined failures in communication through messages among economic agents, those between an informed expert and an uninformed decision maker.

This study tries to analyse the effect of activities of news media in a society where people face a critical issue and they are divided by their beliefs. The news media activities includes disclosing scandals to entertain consumers and/or biasing the choice of consumers on the critical issue. The analysis is based on another communication game model with an informed expert and uninformed decision maker. A majority of the cheap talk communication game models are based on the assumption that messages communicated between a sender and a receiver are unverifiable. The models describe how differences in the evaluation of a situation between players can hinder communication. The model in this study, contrarily, analyses the communication of verifiable evidence between an informed expert and an uninformed decision maker, although the

1） NHK, a Japanese public broadcasting station, has been recently criticised for failing to report important news that could unfavourably impact the government. For problems related to the news media under the Abe government since 2013, see Kingston (Ed.) (2016).

2） Crawford & Sobel (1982) is a seminal work in the field. See also Sobel (2013) for a survey.

communication is intervened by news medias that seek scandals and/or try to bias the players' belief. I argue that in some cases the activities of such news media, exposing scandals and/or sending biased information, contribute to the welfare of the society, while in other cases the activities harm the society. How we can distinguish between the activities that contributes to the society and those that harm the society is the prime concern of this study. If there exists some criteria by which we can distinguish the contribution of such news media to the society, I would like to discuss about the criteria.

For this purpose, I present a model in which players face a binary decision and are divided by their beliefs. The model focuses on a case in which a risky project could cause severe accidents in a society. People's opinions about whether to proceed with such a project are divided by their beliefs. Such projects require detailed risk assessments that must be performed in advance. I test several hypotheses about factors propelling risky projects without appropriate risk evaluations. The model comprises an agent, a decision maker, and general citizens. Before a project commences, the agent as a project operator receives a signal related to the project. The greater the effort by the agent, the higher the probability of receiving a signal; however, the agent must incur the costs associated with these efforts. The decision maker observes this signal and decides whether to proceed with the project. This study focuses on the agent's effort level because it determines the players' expected payoff. The news media is assumed to play four scandal expose roles and a partisan role in decision making. Certain roles can encourage the agents' efforts, while others deter such efforts and are possibly harmful to society.

The model is constructed considering the Fukushima Daiichi nuclear disaster in 2011. It is argued that the disaster was not inevitable; if the utility, Tokyo Electric Power Company (TEPCO) the operator of Fukushima Daiichi plant, had accepted the possibility of great earthquake and tsunami and prepared countermeasures against them, the disaster could have been avoided. It is also pointed out that the problem should be inappropriate risk evaluation beforehand.[3)] In medias the main players of the industry, TEPCO and the regulator, are condemned. Sometimes they insist that the regulator was captured by the utility and the collusion deterred the countermeasure. In other times, they argue that TEPCO postponed taking countermeasures for rent-seeking purpose.[4)] In

3） See Association for the study of Failure (2016), Saito (2015), Takeda (2011) besides reports on the disasters: TEPCO Special Task Force (2012), Investigation Committee on the Accident at the Fukushima Nuclear Power Stations Interim Report (2011) and Final Report (2012) *https://www.cas.go.jp/jp/seisaku/icanps/eng/* (June 27, 2019). National Diet of Japan Fukushima Nuclear Accident Independent Investigation Commission Main Report (2012) *http://warp.da.ndl.go.jp/info:ndljp/pid/3856371/naiic.go.jp/en/report/* (June 27, 2019).

4） For example, See Wide Report: Island of Disaster, *Weekly Asahi*, 2011, Apr. 15, p. 249. (in Japanese) and Disregarded Risk, *Asahi Shimbun*, 2019, Apr. 1st, p. 9. (in Japanese)

this study, the relation between the cause of insufficient risk assessment for risky projects and the role of news media is investigated. For example, is it possible that the collusion between the regulator and the operator has the effect to deter the risk assessment activities? Or, if news media successfully had prevented the collusion by exposing it, would the operator have intensified its research on possible disaster?

The remainder of this paper is organised as follows. The following section presents the basic model construction and propositions. Next, the effects of the news media's possible roles are analysed. The final section offers concluding remarks.

2. Decision Making for Projects Causing Severe Accidents

2.1 Model Construction

This section explains the basic model introduced by Torii (2017) as the basic model for analysis in the next section about the role of news media. The game has two stages in which the important decision, that is, whether to engage in a risky project, is made. All of the players in the game are expected to receive a definite benefit, B. However, the project is also subject to the probability of a disaster that could harm all of the players with amount of damage D. All players are aware of true value B but this is not the case for the value of D. Hereafter, I use adjectives pessimistic and optimistic to describe player's belief of damage: the pessimistic player demonstrates higher expectations about the amount of damage, while an optimistic one exhibits lower expectations.

There are three types of players: a decision maker (DM), an agent, and citizens. The DM and the agent are individual players, while citizens comprise numerous players. The DM formally decides whether to proceed with the project, while the agent is delegated the operation of the project and earns constant profit R. For simplicity, hereinafter, the DM is assumed to be female (she) and the agent is male (he). All players individually anticipate the value for D and believe that their anticipation is true. The beliefs of the DM and the agent are denoted as D_0 and D_A, respectively.

In the first stage, the agent conducts research on the project, which produces a signal for the project stochastically. Accordingly, with effort e, he receives signal with probability $\pi(e)$, $(0 \leq \pi(e) \leq 1,\ \pi'(e) > 0)$. The DM and the citizens are unaware of how the agent made the corresponding efforts given the lack of a signal; they get no signal since the agent made no effort, or they get no signal despite the agent's hard work. The costs incurred by the agent for his efforts are $c(e)$. A signal conveys information about the likelihood of a disaster. Players can revise their estimation of the probability of a disaster occurring once they receive a signal. There are two distinct probabilities: first, the signal is given, and second, a disaster ensues. Further, there are two factors influencing the risk of a disaster: probability and damage. For simplicity, it is assumed that all players can estimate the probability of a disaster using common knowledge while heterogeneously estimating the

extent of damage.

Payoff for the players is defined as the benefits obtained from the project subtracted from the expected value of damage caused by the disaster: $B - E(D)$. The DM decides to proceed with the project if the benefits exceed the expected value of damages. This is equivalent to the DM setting a tolerable threshold for damage and choosing to engage in the project if she believes that the damages will not exceed this threshold.

2.2 Basic Propositions

Under the abovementioned assumptions, the following propositions are proved:

1. The efforts of agent e^* at the equilibrium increase with belief D_A and decrease with private profits R.
2. Assume that the agent's belief, D_A, is constant. Agent's equilibrium effort e^* is maximised when the DM's belief, D_0, takes the value of D_0^*, which is less than D_A. The gap between D_0^* and D_A is proportional to the amount of R. When there is no private profit, $D_0^* = D_A$.
3. Assume that an entity represents both the DM and the agent. Then, effort e^* at the equilibrium increases with the belief of the damage, $D_A = D_0$.
4. A citizen's payoff increases with the agent's belief, D_A. Assuming that the value of D_A is constant, a citizen's payoff is maximised when the agent's effort is maximised.

The agent's effort is determined by the value of information produced by a signal. In other words, more valuable information induces greater efforts while the value of information is an increment of the expected payoff from the signal. Upon receiving the signal, the agent can conduct a more precise risk evaluation, which is reflected in the positive increment of the expected payoff. When the agent has more pessimistic beliefs about damages, the increment rises proportionally to the amount of damage. Therefore, the more pessimistic agent invests greater efforts in a risk assessment, as highlighted in proposition 1. However, signals may not always convey rich information that is useful for the revision of the estimation. There is inevitable loss when risk is weighed on the basis of a signal. Specifically, when the decision to proceed with a project is based on an observed signal, the project is not executed with certain probability even if it brings positive payoffs. In this case, the greater the private profits earned by the agent from the project, the higher the loss incurred for a signal. Higher private profits discourage the agent's effort, as indicated in proposition 1. In other words, the agent becomes reluctant to make efforts because the signal may produce worse news.

The second proposition implies that the agent's efforts are maximised when his belief coincides with that of the DM. This is because the value of information conveyed by the signal is maximised when the threshold set by the DM coincides with the agent's

perceived optimal amount. Such a gap in beliefs leads to cases in which additional information provided by a signal influences the agent's decision to engage in the project, although it has no such effect on the DM's decision. On the other hand, there may be cases in which additional information influences the DM's decision but not the agent's. In such cases, a fraction of the value of additional information is lost from the agent's payoff. Recall that the value of information is an increment of the payoff produced by a signal. Thus, the agent makes the highest effort when his belief is the same as that of the DM. If the agent earns positive private profits, his preferred damage threshold increases in proportion to the amount of private profit. In this case, the gap should be evaluated while adjusting the effect of private profits. The threshold set by the DM coincides with the agent's preferred threshold when the former is lower than the latter. The agent's effort is maximised when the value of information is maximised. Therefore, a significantly lower threshold set by the DM discourages the agent's efforts. In other words, if the DM sets a lower threshold with the intention of deterring a project, this reduces the agent's risk assessment efforts.

The third proposition suggests that when there is no gap between the DM and the agent's beliefs, higher anticipated damages result in greater risk assessment efforts to avoid the disaster. The proposition implies that when the agent has the right to decide whether to execute the project, he should be selected by his pessimism.

Irrespective of the agent's belief, additional information from a signal improves the agent's payoff that is protected from a possible disaster if the DM's beliefs do not differ much from those of the agent. Thus, additional efforts increase payoffs in general. Since citizens' payoff is defined similarly to those of the DM and the agent, their payoff also increases with the agent's effort level. Accordingly, the fourth proposition suggests that citizens' payoff increases with the agent's perceived damage and it is maximised when the threshold set by the DM is at the agent's perceived damage which is adjusted with his private profit. Note that this model does not assume a true distribution of damage because such an assumption may be inappropriate to the once-and-for-all events. In other words, the approach to evaluating the DM's decision cannot be the same as those adopted by economics research to examine optimal decisions deduced from true distributions. Decision making for risky projects is evaluated in this study on the basis of the agent's effort level.

2.3 Liability

Using the basic model, various aspects influencing the effort level of the agent faced with a risky project are analysed. The model first examines the effect of liability. There are two types of liability: strict and negligence. This study focuses on strict liability because it is assumed that the agent's effort is not known to the DM and the citizens. Negligence liability, on the other hand, warrants proof of effort levels to avoid risks. The

following proposition states that the effect of strict liability on the agent's effort differs by whether strict liability is imposed on the DM or on the agent.

5. The imposition of strict liability on the agent increases his effort level, whereas that on the DM deters the agent's effort when the DM's damage-related beliefs are more pessimistic than those of the agent.

Strict liability has the same effect on the agent as an increase in his perceived damage. Therefore, the first half of proposition 5 is based on proposition 1. However, the effect of strict liability on the DM is relatively complicated. Specifically, if the DM makes a decision ignoring liability payments because of her altruistic interest, the liability will have no effect. However, if strict liability has the same effect on the DM as her increased perceived damage because of her selfish interests, then the second half of proposition 5 becomes the outcome of proposition 2. In other words, when $D_0 > D_A$, the liability extends the gap and deters the agent's effort. By contrast, when $D_0 < D_A$ and the amount of liability payment is not so large, the liability may encourage the agent's effort.

2.4 Concealment of the Signal

Thus far, the model assumed that the signal is observable by all citizens. Here, this assumption is eased to give the agent the opportunity to hide information. In this case, only the agent can observe the signal and he may or may not convey the received signal to others, possibly influencing the agent's effort. When the agent does not disclose the signal, others are unaware of whether the signal does not exist or is hidden since the signal is stochastically given. The following proposition suggests that in most cases, the ability to hide the signal does not lower the agent's effort.

6. Assume that the project benefits are greater than the expected value of damages based on the probability estimated from the prior distribution with no information. The agent's effort in the case he has the ability to hide a signal is not less than the effort in the case the signal is observable to everyone. Only if the DM decides to stop the project in the case of no information, the agent may lower his effort if he has the ability to hide information.

If the DM receives no information, she cannot distinguish between whether the signal does not exist or is hidden by the agent. There are two types of equilibria in this case: one in which the project is abandoned if the DM gets no signal and the other in which the project is executed if the DM gets no signal. Each equilibrium can be further divided into two cases. In the first case, the agent has a more optimistic belief about the extent of damage than the DM. In the second case, the agent has a more pessimistic belief. (1) In

the case where the project is abandoned if the DM gets no signal and the agent has a more optimistic belief than the DM, the agent intensifies efforts to acquire a signal to avoid project abandonment. (2) In the case where the project is abandoned if the DM gets no signal and the agent has a more pessimistic belief than the DM, a hidden signal influences the DM's decision in line with the agent's judgment; this increases not only the project's value for the agent but also the value of information conveyed by the signal and as a result, the agent's efforts. (3) In the case where the project is executed if the DM gets no signal and the agent has a more optimistic belief than the DM, hidden signals still alter the DM's decision in line with the agent's judgment, thereby increasing the agent's efforts. (4) Finally, in the case where the project is executed if the DM gets no signal and the agent has a more pessimistic belief than the DM, hidden signals have no effect on the DM's decision since the necessary action is already taken to proceed with the project. Thus, in this case, the agent's effort does not change even if he has the ability to hide the signal. In sum, the agent's effort does not decline in all of the abovementioned cases.

Proposition 6 also alludes to cases in which the ability to hide a signal may render an agent reluctant to make an effort. This is only possible when the project's benefits are fewer than the agent's expected value of damages as per the probability estimated from the prior distribution with no information and the DM decides to stop the project if she gets no signal. The agent considers the project too risky to proceed under his prior expectation of the damage. Assuming a reaction from the DM that she stops the project if she gets no signal, the agent may consider abandoning the project by shirking his effort to get a signal.

3. Role of News Media in Society

3.1 Roles of News Media

The model presented in the previous section describes the decision-making process of a project expected to benefit the society but subject to the possibility of causing severe disaster with a certain probability, although the latter is rare. The model is based on a critical issue currently faced by society: should the nuclear generation continue?[5] The model is characteristic of our modern society confronted with several issues needing alternative judgment. In such a society, people are forced to choose one or the other and are divided by their beliefs about what is correct. For instance, an individual may believe that the plan proposed by the opponent will be disastrous to society while that proposed by the allied party will be beneficial. Thus, the present model can be extended to analyse

5） A key factor that contributed to the Fukushima Daiichi nuclear disaster is insufficient safety research on the power generation at the plant. See, for example, Association for the Study of Failure (2016).

general tasks in society.

News media plays two kinds of roles in the game evaluated in this study: expose and partisan roles. News media is expected to play expose roles to entertain news receivers, which includes reporting collusion and corruption and withholding important information. Partisan roles, on the other hand, bias players' prior beliefs by controlling for the provision of news to persuade players to shape their beliefs in line with those of the news media.

This study evaluates these roles with a focus on how they affect the agent's efforts for risk assessments. As described in the game presented in the previous section, no player knows the correct or optimal decision. Even the probabilistic distribution of damage is not assumed to exist. The feasibility of assuming the true distribution of an accident for the once-and-for-all events remains unclear. Only we know is that the accident is extremely rare event. Therefore, the DM's decision cannot be evaluated in comparison with the optimal decision. Nevertheless, the model proves that greater agent efforts increase the payoff for all citizens. Thus, even if the players' beliefs are not aligned, that is, there is no consensus on the maximum risk that can be tolerated by society, precise information combined with intense agent efforts will undoubtedly prove beneficial to society. Given the discussion thus far, this study examines the role of the news media in the game on the basis of the agent's effort level at the equilibrium.

3.2 Expose Roles

This section examines four types of expose roles: reporting collusion between the DM and the agent to prevent the agent from capturing the DM where capturing refers to the agent's manipulation of the DM's belief, disclosing important information withheld by the agent, reporting bribery by the agent's candidate, and checking the imposition of strict liability on the agent. These four roles are intuitively considered to discipline the agent's behaviour.

However, not all of the roles are effective in deterring the agent from shirking his effort to conduct an appropriate risk assessment.

Preventing Collusion

In regulated industries, the capture of authorities by regulated companies has often been pointed out.[6)] The advantages of possessing private information on business operations allow the agent to influence authorities' decisions. Authorities must rely on information provided by the agent when regulating a business in the industry. In such situations, the agent can buy out the DM. In this game, the agent has the incentive to capture the DM when their beliefs show discrepancies. The first expose role of the news

6) See Stigler (1971) and Laffont & Tirole (1991).

media or journalists is to report capturing activities or bribery by the agent and to prevent him from engaging in such behaviour. When the agent has more optimistic beliefs than the DM and/or may privately benefit from the project, he is motivated to capture the DM and attempts to ease the project criteria. If he succeeds in capturing the DM, then according to proposition 2, because the DM's decision become aligned with or close to that of the agent, the value of the project and the agent's efforts increase. Increments in the expected payoff from a signal further increase when the DM makes decisions that are aligned with the agent's preference; thus, it pays off to invest time and effort in the agent.[7] Therefore, rather than enhancing, this collusion preveuting role deters the agent's effort.

Disclosing Hidden Important Information

If the agent is the only competent operator in the project, the signal may be observed only by the agent. When no signal is provided, the DM and the citizens are unaware of whether the signal is unavailable or hidden by the agent because the signal is stochastically given. The DM makes a decision considering both possibilities. Thus, the agent hides the signal by concealing information to produce an outcome that is more preferable to the agent. In this case, the agent hides important information that affects public interests to manipulate the DM's decision and influences a decision that is preferable to him or generates private profits. The second expose role of the news media is to reveal such concealment and make such information known to the citizens and to *correct* the DM's decision. However, proposition 6 suggests that this role does not contribute towards enhancing the agent's efforts. When the DM decides to execute the project with no information, the preferable outcome for the agent is that the DM's decision is aligned with his decision. In this case, hiding the signal increases the value of the information for the agent and induces further agent efforts. By contrast, preventing the agent from hiding the signal lowers the agent's effort level in the risk assessment. Thus, this role does not enhance but discourages the agent's effort.

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7) Since this model considers the case in which the DM decides to execute the project when she gets no signal, raising the DM threshold (making her more optimistic) such that it is closer to that of the agent has no effect on the decision. On the other hand, if a signal is available, the agent's expected payoff from the projects depends on the gap between the DM's beliefs and the agent's beliefs. A smaller gap increases the agent's payoff because the risk is more precisely evaluated and the gap between the DM's decision and the agent's preference decreases. Therefore, increments in the agent's expected payoff from a signal, which is the value of additional information for the agent, increase as the gap in the beliefs between the DM and agent decreases. This provides the agent with the incentive to make greater efforts in conducting a risk evaluation.

Preventing Corruption

The selection process for the agent is not explicitly explained in the model presented in the previous section. While the agent's position is given from the beginning, it is natural to assume a selection process for the agent. The third expose role is checking the selection process for the agent. As proven in the previous section, beliefs of damage and private profit are key factors determining the agent's effort. Therefore, if the agent is selected from a pool of citizens, the following criterion should be considered to determine if a citizen qualifies as an agent. An optimistic agent who believes in smaller damage or earns higher private benefits from operating the project should not be selected because the risk assessment efforts by such an agent is expected to be low. Further, the agent tends to reduce the necessary risk assessment effort while he is eager to acquire the contract because he expects higher private payoff than those of other candidates. If certain resources are needed to acquire the contract, the candidates invest a large amount of resources in the selection process. Corruption and bribery are feared at most. A simple auction or competition is not appropriate for the process. The third expose role of the news media is to check the fairness of the selection process. The news media should ensure a fair selection of pessimistic agents with considerably high expectations about possible damages and low private profits. Finding out and disclosing hidden private profits of candidates from the project is expected to work in the same line.

According to propositions 1 and 4, this role enhances the agent's efforts and the citizens' payoff.

Monitoring Strict Liability Enforcement

Proposition 5 suggests that the agent will be discouraged from making an effort if he anticipates the liability to be avoided at a later stage. Thus, the implementation of liability should be checked for ambiguity. Liability must be strict, free of faults, and non-negligent. Even if the project is finalised, a society has multiple projects, and the situation is described by a *repeated game*, avoiding the liability of a project that has already been executed affects the execution of other projects. The fourth expose role of the news media is checking the imposition of strict liability on the agent. The liability is expected to have a greater influence in the case of a higher charge. It is not possible for an agent to cover the full amount of damage caused by severe accidents. In this case, even a small charge helps enhance the agent's efforts anyway.

Effects of Expose Roles on the Agent's Efforts

In sum, the last two expose roles of the news media encourage the agent's effort, while the first two roles have no such effect. In some cases, the effect may be counter-intuitive. If the agent is optimistic and expects lower damages, collusion between the agent and the DM seems to deter the agent's incentive to conduct a risk assessment, which is similar to

the effect of private profits as proven in proposition 1. Nevertheless, capturing the DM does not make the agent more optimistic. Preventing collusion results in decreasing the agent's incentive to conduct a risk assessment.

Revealing concealed information seems to have the same effect as private profits because it manipulates the DM's decision and produces preferable payoffs for the agent. In this case, the ability to hide a signal may discourage the agent's efforts. However, this is not the case when the agent's effort is determined by the value of the effect on the DM's decision, and the ability to manipulate decisions increases the value of the information.

Predicting the effect of a news media's exposing activity is not easy. Revealing collusion or corruption is intuitively assumed to be an important role played by the news media; however, it may not be as effective in evaluating the effects on citizens' payoffs. In certain cases, revealing collusion or corruption can deter the agent's effort and even harm citizens' welfare, while in other cases, exposing such mal-activities can contribute to the society.

3.3 Partisan Role

This study presents a decision-making regime in which people are divided by their beliefs. The news media is no exception for being affected by such beliefs. The news media opinions on an important issue should be based on the media companies' own beliefs.[8] It is also natural for the news media to play a partisan role. Dewatripont & Tirole (1999) demonstrated that it is economically efficient to collect information using partisan advocates. While their proposition is based on dispute resolution in court, it can be applied to the news media as partisan advocates. When the news media acts as a partisan entity, it may attempt to persuade the receivers of news, thus affecting their beliefs.[9] The news media can even affect public opinion and the beliefs of DMs. In some cases, information provided by the news media may be used to control public knowledge. As a partisan entity, the news media may consider such persuasive activities a mission. Through its advantage of gathering information, the news media may attempt to deter a project if it believes that the project is too dangerous and will harm society. This influence on society can be interpreted as the news media's partisan role.

Indeed, if the DM sets a tighter (lower) damage threshold, the agent will have to persuade her with concrete evidence to execute the project. In this case, the agent will make every effort to derive a signal by investing significant efforts in the risk assessment. According to the second proposition, however, this inference is valid only when the DM has a more optimistic belief about damages. If the DM already has a more pessimistic

8) See Patterson & Donsbach (1996).

9) This strategy of the news media to shift the beliefs of consumers is called media bias and analysed intensely. See Gentzkow, Shapiro, & Stone (2015) for a survey.

belief after due consideration of the adjustment from the private profit, the agent's risk assessment efforts are suppressed by the more pessimistic decision criteria. For example, if warning reports by the news media affect public opinions negatively about a project, the more pessimistic criteria are then imposed on the project execution, which reduces the agent's risk assessment efforts. In fact, such an effect has been highlighted in the case of the Fukushima Daiichi nuclear disaster. Takeda (2011) argued that electricity utilities proceeded with the nuclear power generation under intense opposition movement, which resulted in enhancing the project's risk.[10)]

4. Conclusion

The contribution of the news media to society is not such simple when opinions are divided on critical issues. The cases described in this study indicate that it is difficult to predict the final effect of the news media's various roles on the agent's effort levels. Contrary to the original expectation, certain roles have adverse effects. They deter the agent's efforts for appropriate risk assessment and impose greater risks on society.

When evaluating the effect of these roles, it is important to examine the effect of these roles on the value of information for the operator of the project. If a news media activity increases the value of information, the incentives to assess the issue will be greater; however, if an activity decreases the value of information, society is obliged to decide on the issue without adequate knowledge.

When the news media highlights ambiguities in a liability contract with an agent and the contract is amended to ensure the implementation of liability, it helps enhance the value of information produced by the signal for the agent and encourage his efforts. On the other hand, partisan news media may try to obstruct a project when it believes that the projects are of high risk. If the news media accomplishes this objective by influencing the DM's belief, this lowers the value of information for the agent, thereby detrimentally impacting his effort and the citizens' expected payoffs.

Further studies are necessary to address the manipulation of signals. This research focuses on communication between players with concrete evidence. Then it focuses the analysis on the concealment of signals. To evaluate the effect of fake news, the present

10) TEPCO Special Task Force (2012) indicated three background factors deterring the countermeasure for severe accidents. One of these factors is that if the need for countermeasures was identified, the company was likely to face a greater risk of a lawsuit. Another factor is that the growing concern about countermeasures for severe accidents would have intensified anxiety levels among neighbouring residents and further provided an impetus to an opposition campaign. Thus, TEPCO insisted that if there were no opposing movement against nuclear generation, they could have taken appropriate countermeasures against severe accidents.

model should be extended to include the possibility of altering the signal. Another possible extension of the model is to consider the news media as an agent. The news media does not operate a project but conducts research on the issue and shares its findings with the public. To this effect, it is important to examine how society incentivises the news media to study critical issues. This is particularly because it is cautioned that news is given without an in-depth investigation and become superficial.[11)]

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11) For example, see Jensen (1979).