Cyber Violence

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Outline

Cyber Violence

According to the Statistical Report on China's Internet Development

- By December 2022, the number of Internet users has reached 1.067 billion.
- The number of mobile Internet users has reached 1.065 billion.

图 1-1 网民规模和互联网普及率

Figure: Size of Internet users and Internet penetration rate

Cyber Violence

- Online social network provides a platform and channel for people to obtain and exchange information.
- Due to the lax control of the Internet, it also causes a series of social problems, such as false information and network rumors.

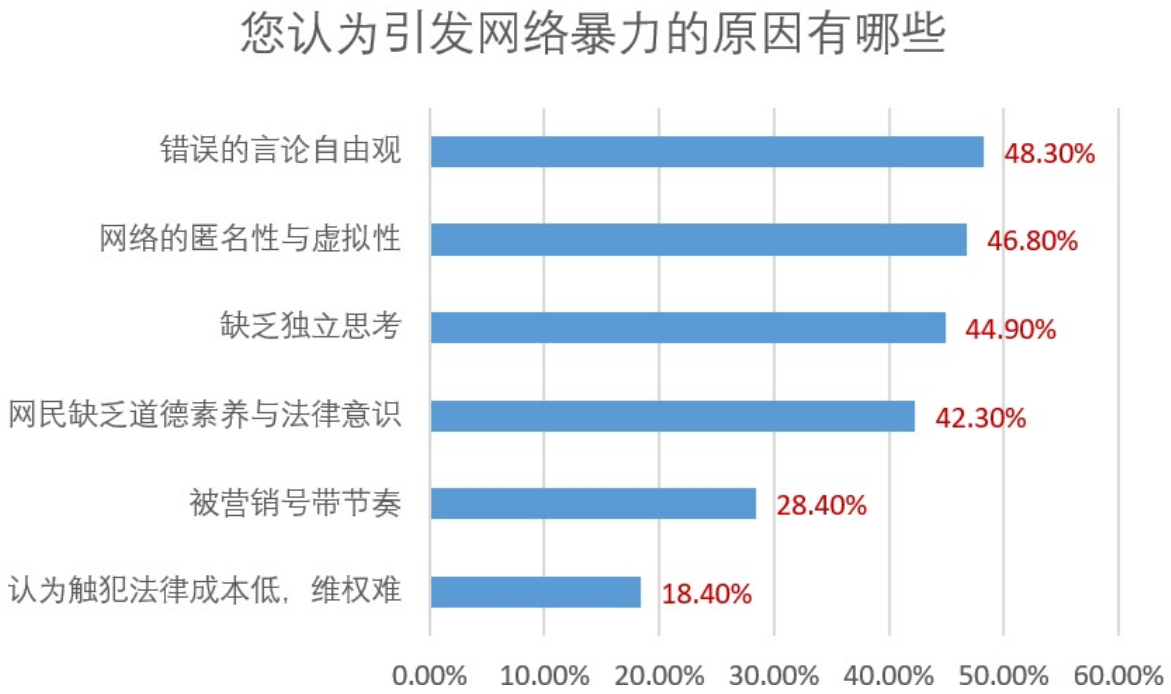


Figure: Questionnaire on Cognitive Attitudes towards Cyber Violence

Cyber Violence

- Cyber violence may cause the privy "social death", or suicide and other extreme behavior.
- The greater the influence of the speaker, the more serious the damage caused by the misstatement.

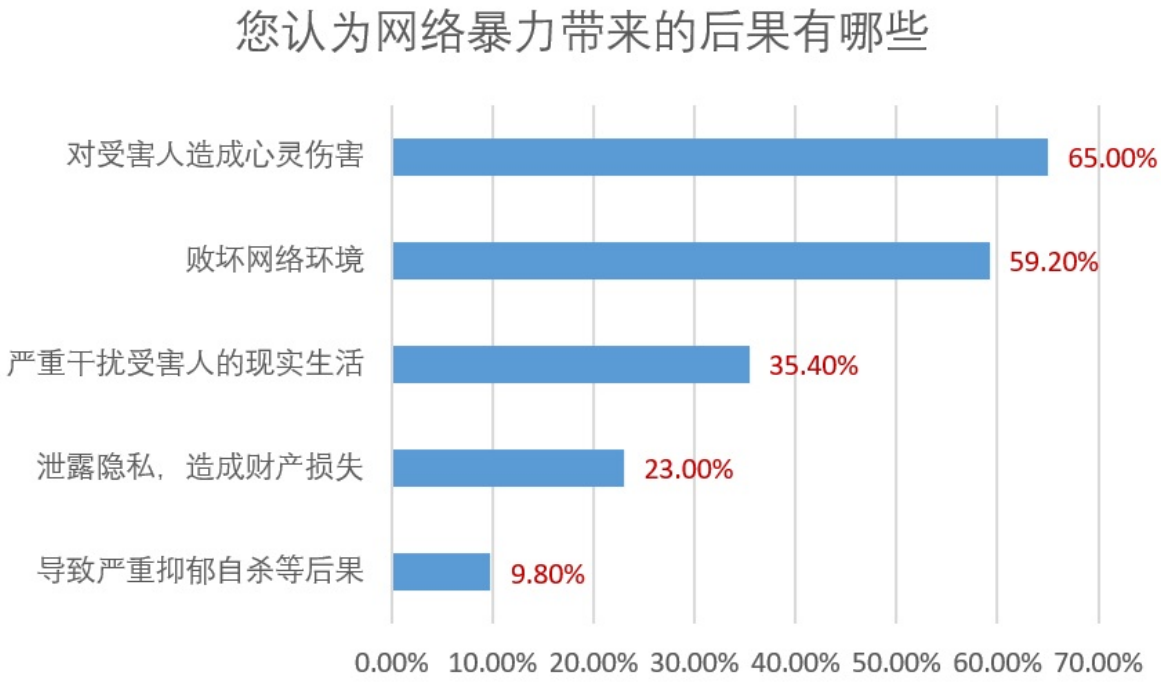


Figure: Questionnaire on Cognitive Attitudes towards Cyber Violence

Supervision measures

- Traditional laws and regulations take the way of ex post relief, which can not fully adapt to the changes in the network field.
- The cost of subsequent dissemination of information in the Internet age is low, and it is difficult to control subsequent dissemination.

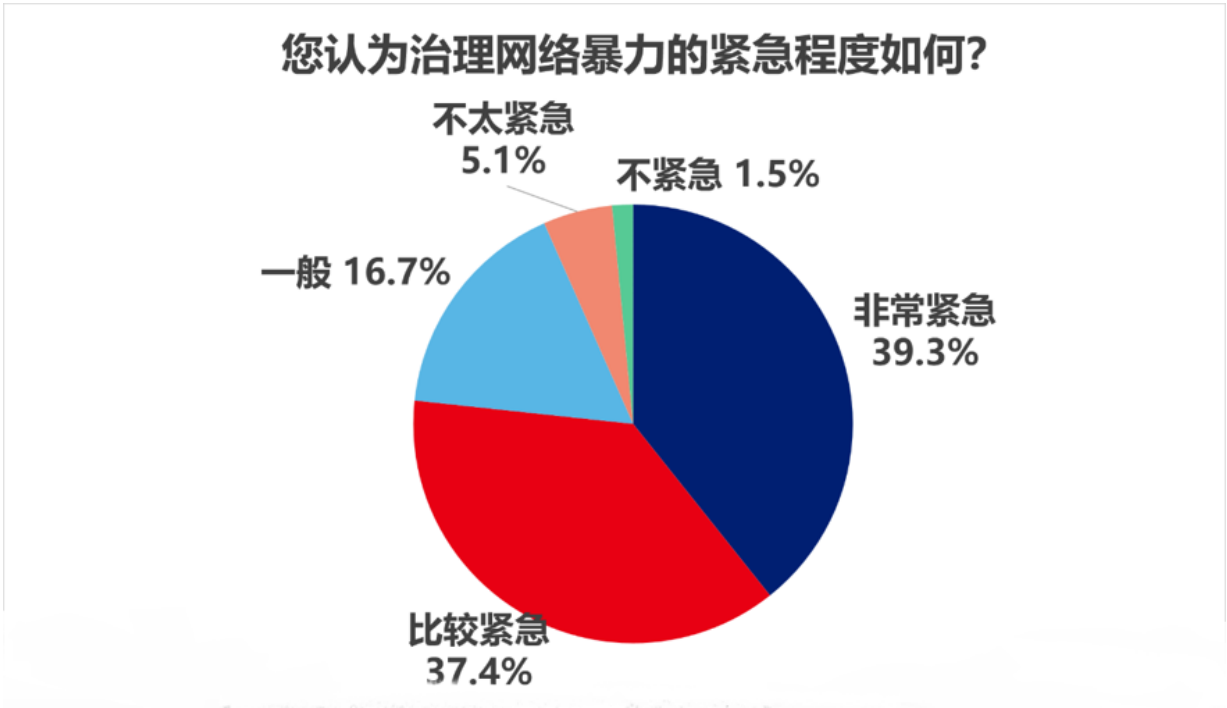


Figure: Questionnaire on Cognitive Attitudes towards Cyber Violence

Supervision measures

Governments

- Some scholars believe that the government is an important force in the rumor refuting action.
- According to the study of Zhao et al., the government is the most effective regulator in the process of rumor propagation.

Opinion Leaders

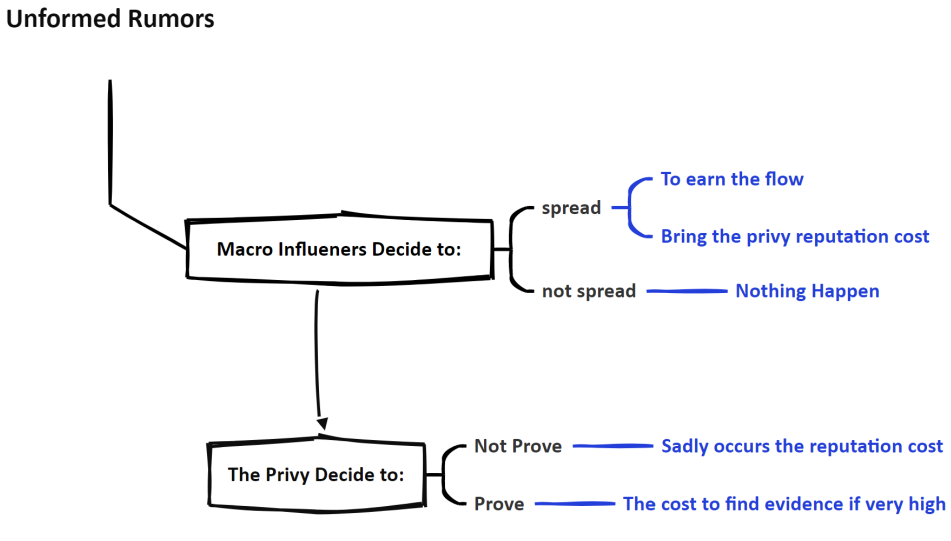
- Jain shows that opinion leaders have an important impact on information dissemination in social networks, thus influencing people's decision-making.
- The research results of Wang Xiwei et al show that opinion leaders can actively guide public opinion and have a strong influence on the spread of rumors.

Outline

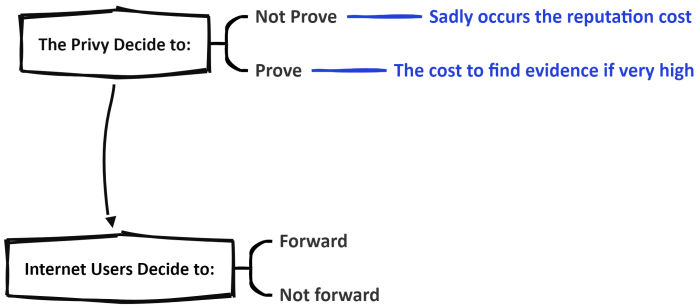
Players in the Game

- Macro influencer(网络大V),
  - Macro influencers **only** care about how much flow(流量) they could earn by spreading inflammatory rumors
- The privy(当事人)
  - Nature draws a type t_i for the privy from a set of feasible types $T = t_1, t_2$ according to a probability distribution $p(t_i)$
- Internet users(网民)
  - The internet users choose whether or not to forward the rumor based on their judgments, i.e. their behavior represents their judgments
  - Internet users have "rationality"

Game Process



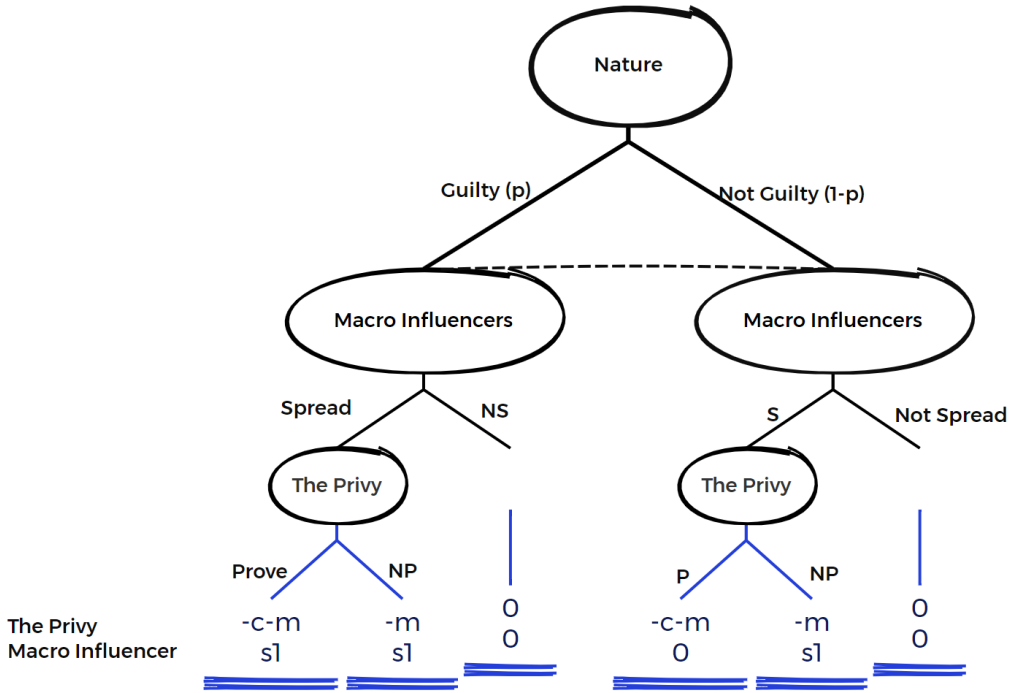
(a) Macro Influencer & The Privy



(b) The Privy & Internet User

- For simplicity, we consider the game of macro influencer & the privy and the game of the internet users & the privy **separately**.
- Macro influencer & The privy: whether to spread the rumors → whether to prove himself
- The privy & The internet users: whether to spread the rumors → whether to further forward the rumor
- The privy's payoff is **consistent** between these 2 games while we assume the behavior of macro influencer and internet user are **independent**

Game Tree of Macro Influencer & The Privy

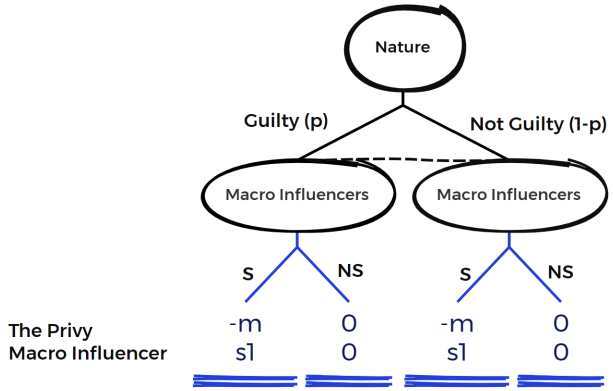


- To find the solid evidence costs the privy a lot, i.e. c is large
- If the rumors are spread, the reputation cost is even larger, i.e. $m > c$
- Macro influencer believes the privy has probability p to be guilty, and probability $1 - p$ to be not guilty.
- By spreading the rumors, the macro influencer could earn revenue from the flow of s_1

Solutions

Recalling Worker-Firm Game

- Step 1: Backwards Induction



- Step 2: calculating the expected payoff of macro influencer
  - S: $s_1 \times p + s_1 \times (1 - p) = s_1$
  - NS: 0
- The **subgame perfect nash equilibrium**: [Spread, Not Prove]
- The calculation is irrelevant to the value of p, therefore the **PBE** is [Spread, Not Prove, $p \in [0, 1]$]

Game Tree of Internet Users & The Privy

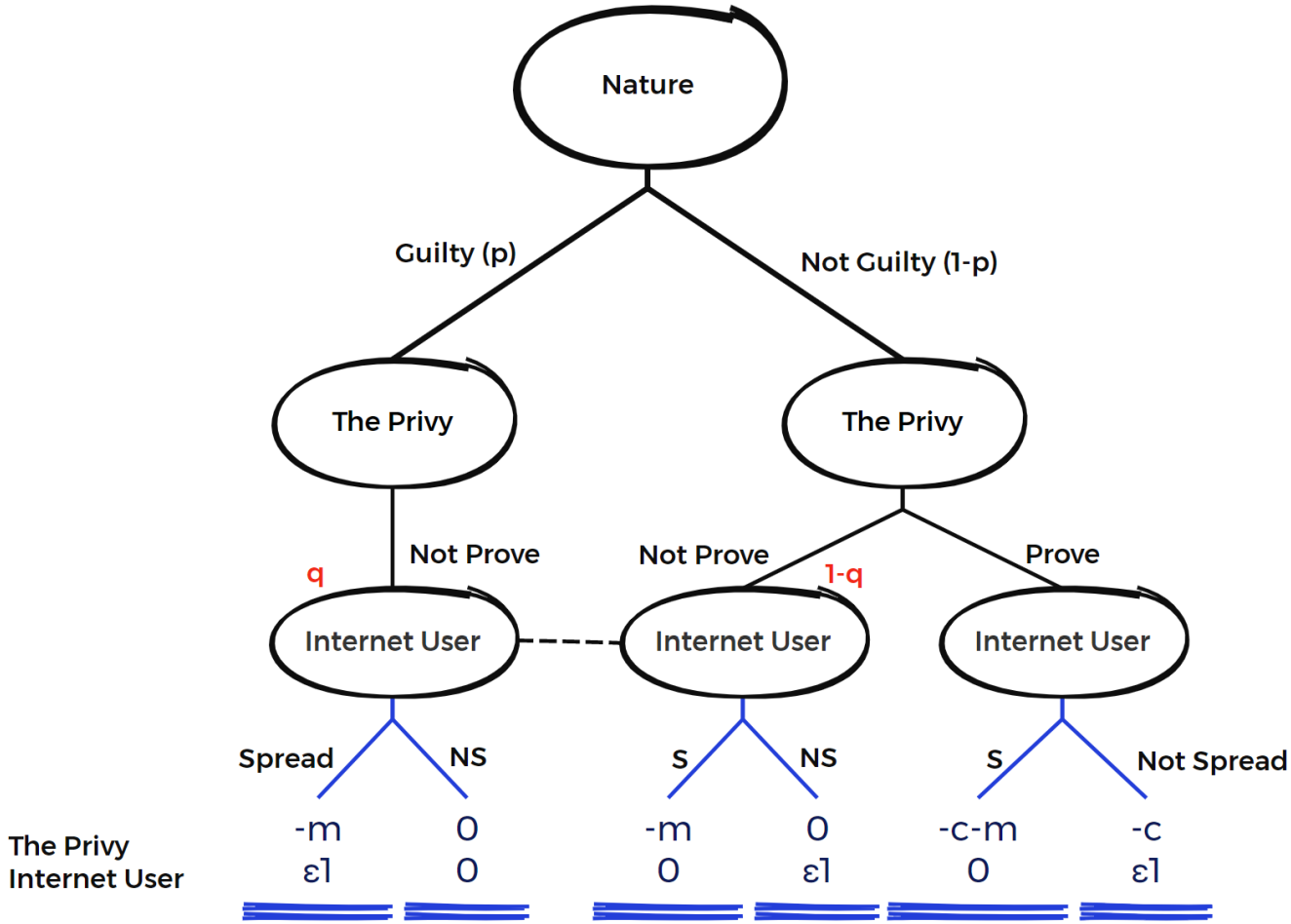


Figure: Game Tree of Internet Users & The Privy

Nash Equilibrim

Assume here nature draws the privy' type with $p = 1 - p = \frac{1}{2}$

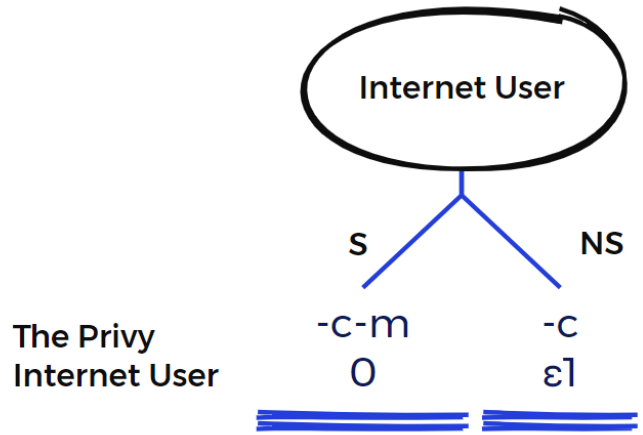
- Payoff Matrix

	Internet Users				
The Privy		(S,S)	(S,NS)	(NS,S)	(NS,NS)
	(NP,P)	$-m - \frac{c}{2}, \frac{\epsilon_1}{2}$	$\frac{-c-m}{2}, \epsilon_1$	$\frac{-c-m}{2}, 0$	$-\frac{c}{2}, \frac{\epsilon_1}{2}$
	(NP,NP)	$-m, \frac{\epsilon_1}{2}$	$-m, \frac{\epsilon_1}{2}$	$0, \frac{\epsilon_1}{2}$	$0, \frac{\epsilon_1}{2}$

- 4 Nash Equilibrium:
  [(NP,NP), (S,S)], [(NP,P), (S,NS)], [(NP,NP), (NS,S)], [(NP,NP), (NS,NS)]

Subgame Perfect Nash Equilibrim

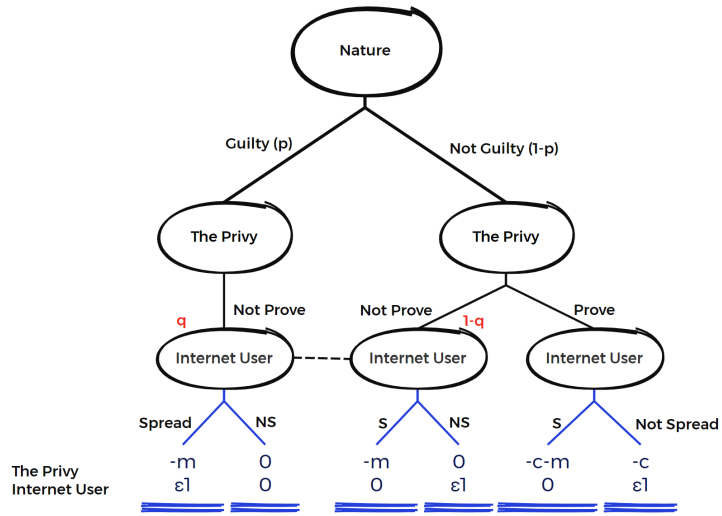
- When the privy is not guilty and tries to prove himself, the subgame perfect strategy for the internet user is not to spread the rumor.
- Eliminating [(NP,NP), (S,S)], [(NP,NP), (NS,S)]
- 2 Subgame-perfect Nash Equilibrium: [(NP,P), (S,NS)], [(NP,NP), (NS,NS)]



Perfect Bayesian Nash Equilibrium

Set belief: $q = \frac{Prob\ of\ Receving\ NP\ From\ Guilty\ Privy}{Prob\ of\ Receving\ NP}$

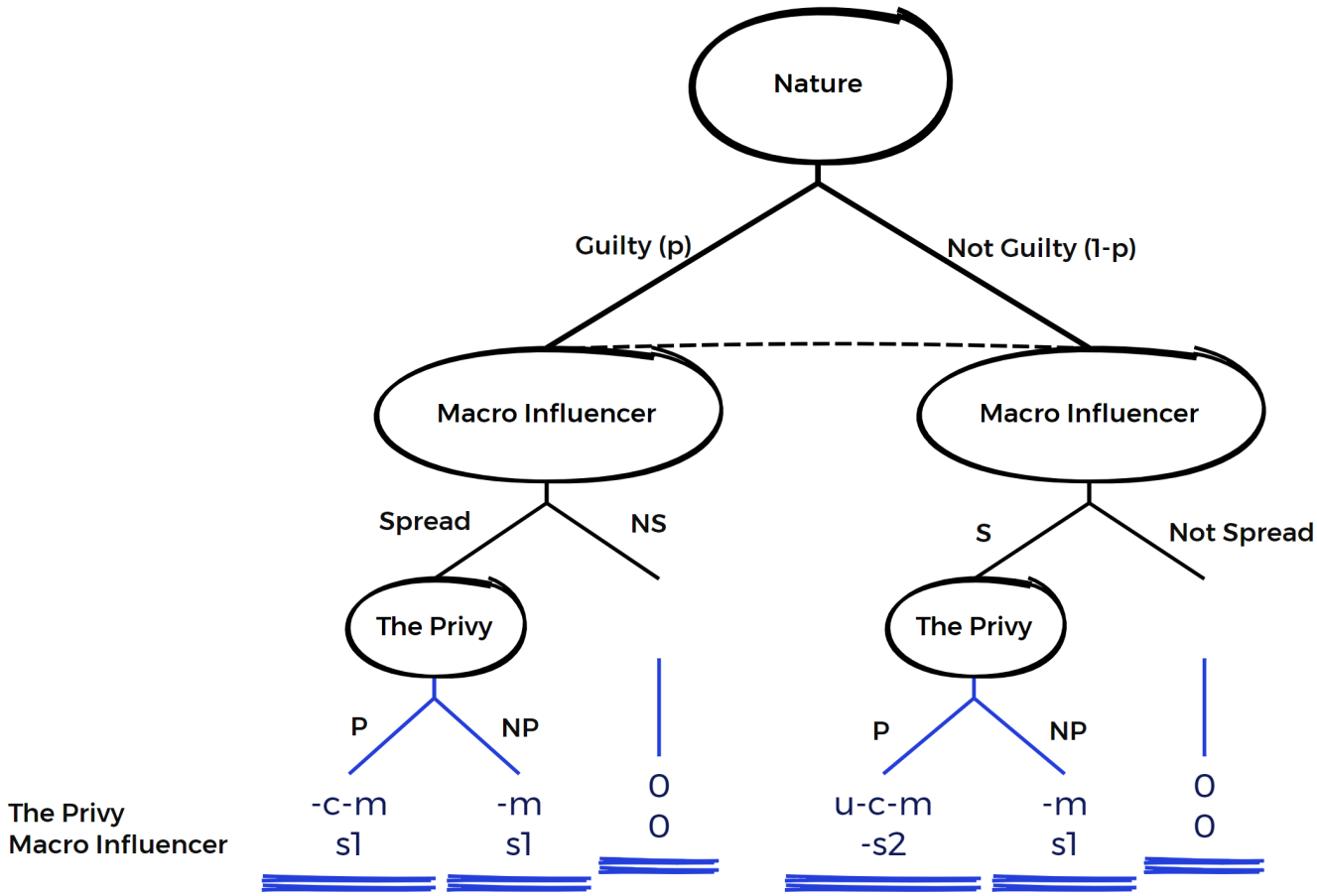
- [(NP,P), (S,NS)]
  - Separating Strategy
  - Requirement 3: $q = 1$
  - PBE: [(NP,P), (S,NS), q=1]
- [(NP,NP), (NS,NS)]
  - Pooling Strategy
  - Requirement 3: $q = 0.5$
  - PBE: [(NP,NP), (NS,NS), q=0.5]
- 2PBEs: [(NP,P), (S,NS), q=1], [(NP,NP), (NS,NS), q=0.5]



The Role of Supervision

- Recalling Basic Assumptions
  - The macro influencer **only** cares about the flow they earned
  - The Internet user are **rational**
  - The cost to find solid evidence is high, $c > 0$
  - The reputation cost of spreading the rumors is even higher than the cost of finding evidence, $m > c$
- The Role of Supervision
  - **Macro Influencer:** If they wrongly spread the rumors, they should pay compensation to the privy, $-s_2$
  - **The Privy:** If they are wrongly spreading the rumors, they could get a lump sum compensation, μ
  - **Internet Users:** If the internet users wrongly spread the rumors of the not guilty privy, they will incur negative utility, $-\epsilon_2$

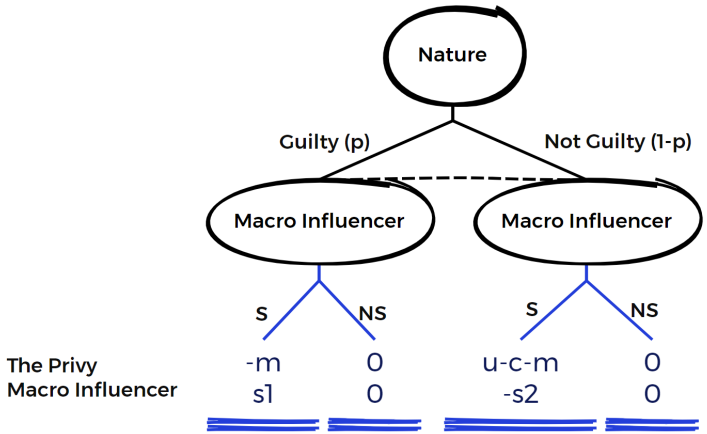
Game Tree of Macro Influencer & The Privy



- The only difference: when the macro influencer spreads the rumors of the innocent privy, they should pay the privy s_2 as compensation, while the privy will receive μ.

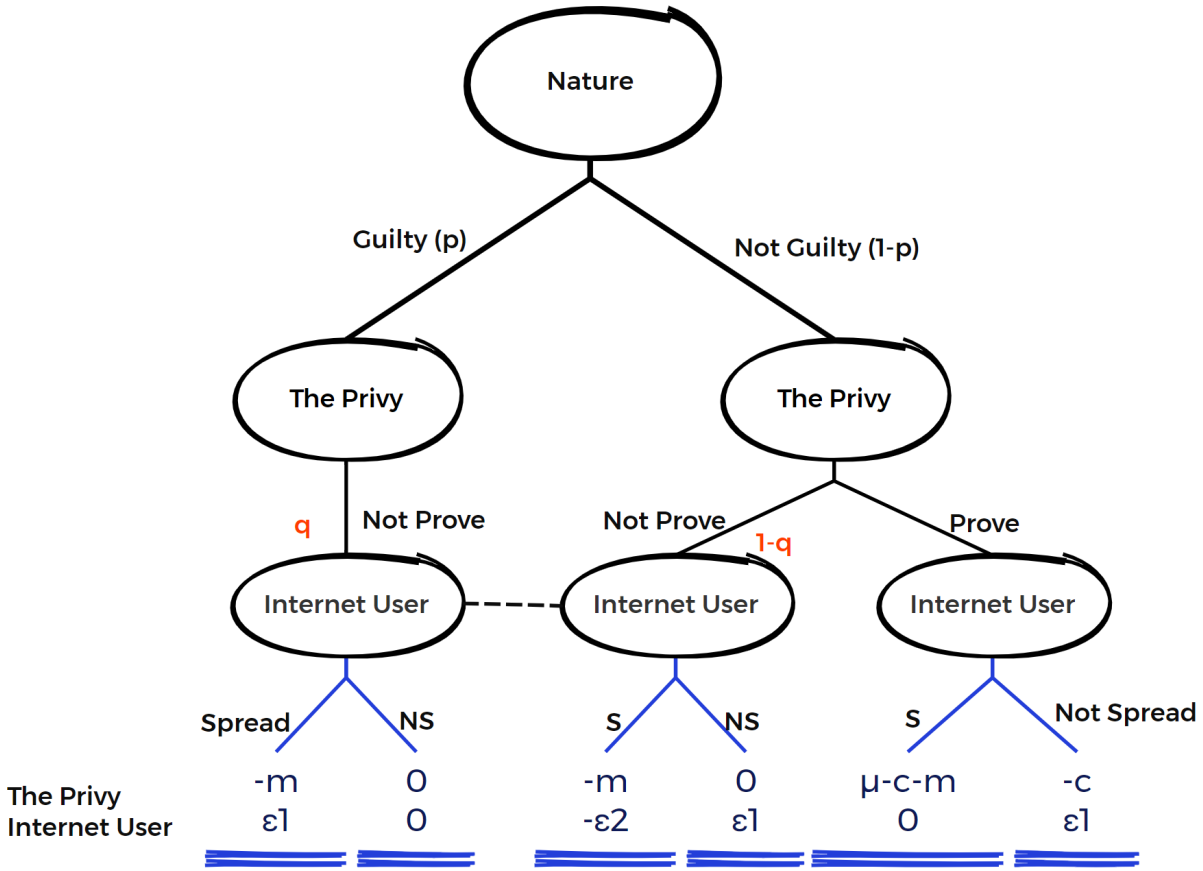
Solutions

- Step 1: Backwards Induction



- Step 2: calculating the expected payoff of macro influencer
  - S: $s_1 \times p - s_2 \times (1-p) = s_1 = (s_1 + s_2)p - s_2$
  - NS: 0
- Perfect Bayesian Nash Equilibrium:
  [NS, P, $p < \frac{s_2}{s_1+s_2}$], [S, NP, $p > \frac{s_2}{s_1+s_2}$]

Game Tree of Internet Users & The Privy



- The only difference: when the internet users spread rumors of innocent privy, they have negative utility $-\epsilon_2$

Nash Equilibrium & Subgame Perfect Equilibrium

Assume here nature draws the privy' type with $p = 1 - p = \frac{1}{2}$

- Payoff Matrix

	Internet Users				
The Privy		(S,S)	(S,NS)	(NS,S)	(NS,NS)
	(NP,P)	$\frac{\mu-c-2m}{2}, \frac{\epsilon_1}{2}$	$\frac{-c-m}{2}, \epsilon_1$	$\frac{\mu-c-m}{2}, 0$	$-\frac{c}{2}, \frac{\epsilon_1}{2}$
	(NP,NP)	$-m, \frac{\epsilon_1-\epsilon_2}{2}$	$-m, \frac{\epsilon_1-\epsilon_2}{2}$	$0, \frac{\epsilon_1}{2}$	$0, \frac{\epsilon_1}{2}$

- Subgame also eliminates the strategy of "(,S)"
- 2 Nash Equilibrium = 2 Subgame-Perfect Nash Equilibrium: [(NP,P), (S,NS)], [(NP,NP), (NS,NS)]
- After supervision, the strategy of "(,S)" is even not in the Nash Equilibrium Strategy Sets

Perfect Bayesian Nash Equilibrium

Set belief: $q = \frac{Prob\ of\ Receving\ NP\ From\ Guilty\ Privy}{Prob\ of\ Receving\ NP}$

- [(NP,P), (S,NS)]
  - Separating Strategy
  - Requirement 3: $q = 1$
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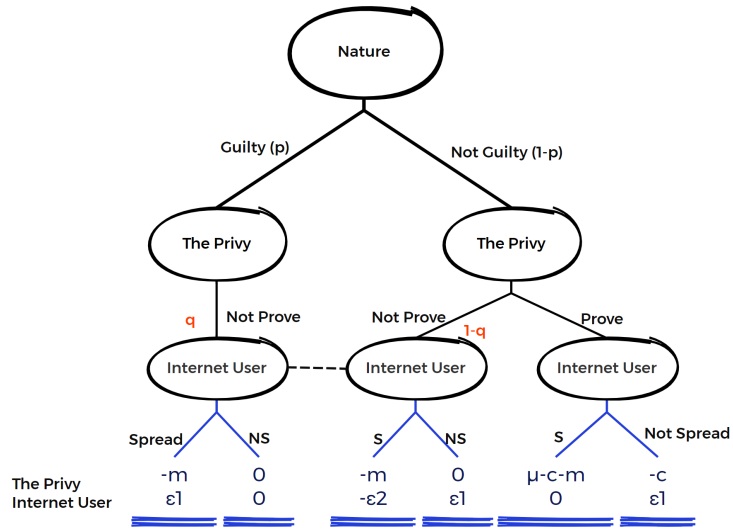
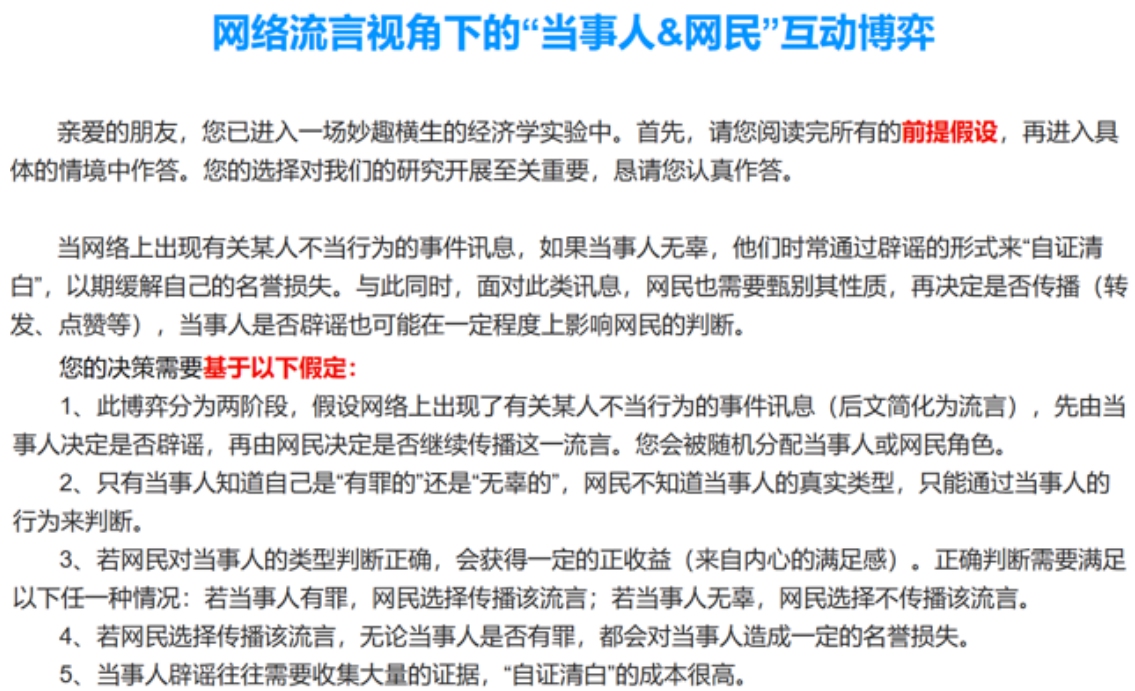


Outline

Design and sampling

We designed several online rumor scenarios to capture real-life reactions.

- Process: Assumptions → Randomly assign roles → Q&A
- We collect 200 questionnaires with 97 Internet Users and 103 Privies, and exclude irrational people 11 and 19 respectively.



网络流言视角下的"当事人&网民"互动博弈

亲爱的朋友，您已进入一场妙趣横生的经济学实验中。首先，请您阅读完所有的**前提假设**，再进入具体的情境中作答。您的选择对我们的研究开展至关重要，恳请您认真作答。

当网络上出现有关某人不当行为的事件讯息，如果当事人无辜，他们时常通过辟谣的形式来"自证清白"，以期缓解自己的名誉损失。与此同时，面对此类讯息，网民也需要甄别其性质，再决定是否传播（转发、点赞等），当事人是否辟谣也可能在一定程度上影响网民的判断。

您的决策需要**基于以下假定：**

1、此博弈分为两阶段，假设网络上出现了有关某人不当行为的事件讯息（后文简化为流言），先由当事人决定是否辟谣，再由网民决定是否继续传播这一流言。您会被随机分配当事人或网民角色。

2、只有当事人知道自己是"有罪的"还是"无辜的"，网民不知道当事人的真实类型，只能通过当事人的行为来判断。

3、若网民对当事人的类型判断正确，会获得一定的正收益（来自内心的满足感）。正确判断需要满足以下任一种情况：若当事人有罪，网民选择传播该流言；若当事人无辜，网民选择不传播该流言。

4、若网民选择传播该流言，无论当事人是否有罪，都会对当事人造成一定的名誉损失。

5、当事人辟谣往往需要收集大量的证据，"自证清白"的成本很高。

Figure: Introduction and assumptions

Internet Users' results

Internet Users' reactions when faced with "Not prove" to "Prove":

- The number of netizens who chose "Spread" drops by 46.7%, and those who chose "Not spread" increases by 150%.

第6题：你的角色是 网民。你看到一条有关某人不当行为的讯息，且当事人 没有进行辟谣，此时你需要在继续传播或不传播流言之间做出选择。如果你对当事人的类型判断正确（当事人有罪，你选择传播；当事人无辜，你选择不传播），你会获得收益3；如果你判断错误，你的收益为0。你的选择是： [单选题]

第5题：你的角色是 网民。你看到一条有关某人不当行为的讯息，且当事人 有进行辟谣，此时你需要在继续传播或不传播流言之间做出选择。如果你对当事人的类型判断正确（当事人有罪，你选择传播；当事人无辜，你选择不传播），你会获得收益3；如果你判断错误，你的收益为0。你的选择是： [单选题]

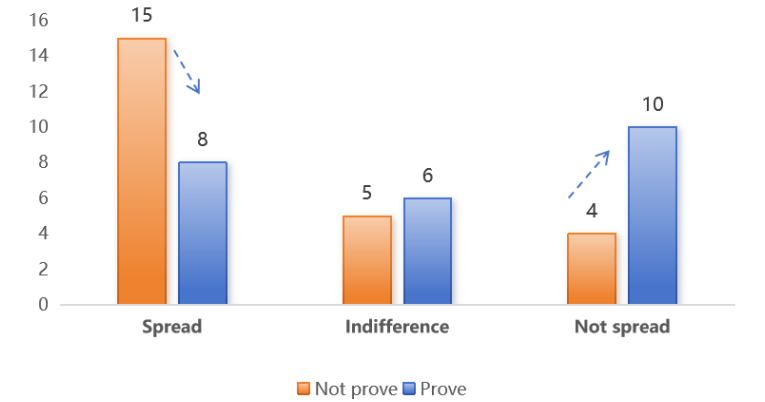


Figure: Netizens' reactions when faced with NP and P

Internet Users' results

Individual tracking:

- Netizens are less likely to spread when observing P: 70.9%
- Netizens are more likely to spread when observing P: 9.3%
- NP or P does not affect netizens' choice: 19.8%

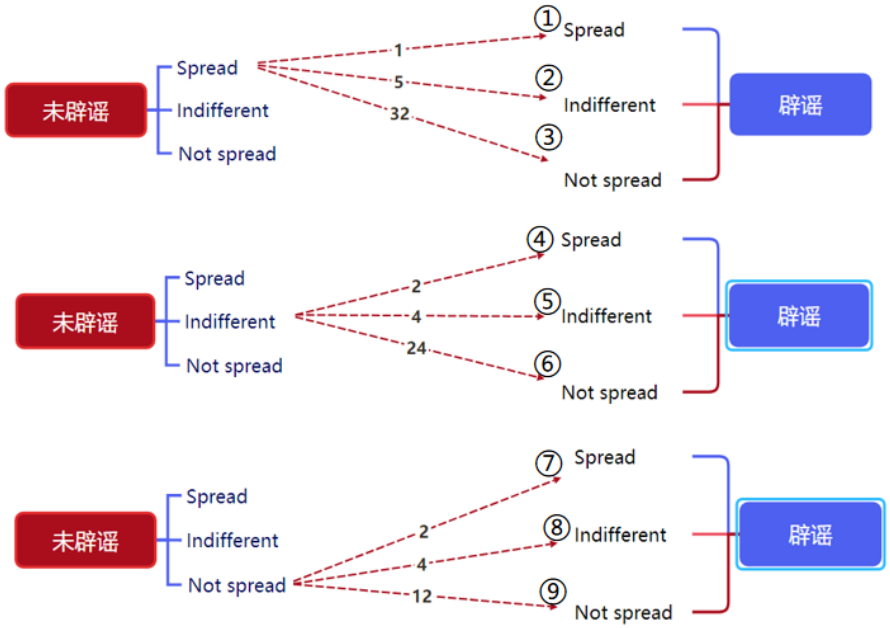


Figure: Netizens' reactions when faced with NP and P

Internet Users' results

Supervision: Netizens who spread false rumors will be punished.

- Netizens are less likely to spread when supervision appears: 64.0%
- Netizens are more likely to spread when supervision appears: 11.6%
- Supervision does not affect netizens' choice: 24.4%

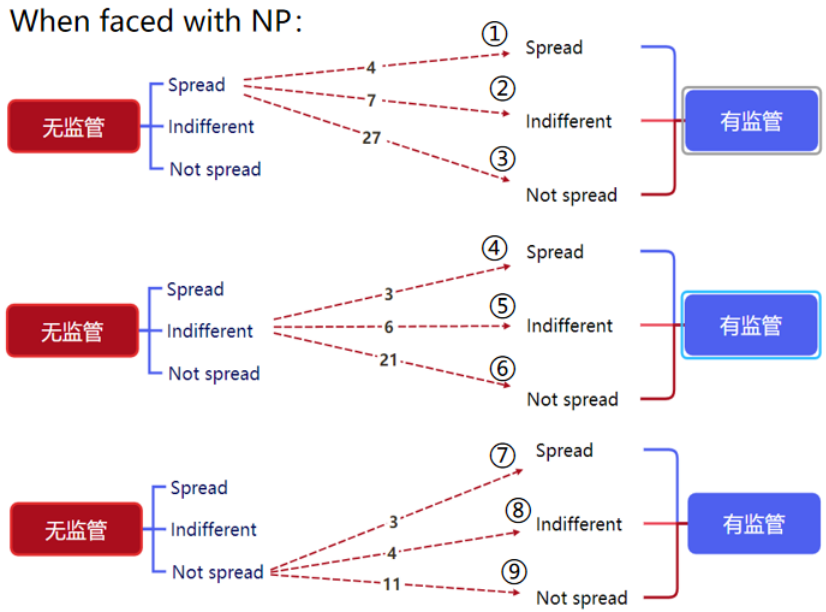


Figure: Netizens' reactions between different supervision status

The Privy's results

Privies' reactions when relative cost of self-proving decreases:

- The number of privies who chooses "Prove" increases by 30.0%, and those who chooses "Not prove" drops by 42.1%.

第2题：你的角色是 当事人。网络上流传着有关你某一不当行为的讯息，你知道自己的真实类型是 "无辜的"。已知"自证清白"的成本为-5，是否辟谣可能会影响网友对待流言的态度。但无论你是否选择辟谣，网友都有可能继续传播该讯息。若网友选择继续传播，你将会遭受名誉损失-4。你的选择是： [单选题]

第4题：你的角色是 当事人。网络上流传着有关你某一不当行为的讯息，你知道自己的真实类型是 "无辜的"。已知"自证清白"的成本为-5，是否辟谣可能会影响网友对待流言的态度。但无论你是否选择辟谣，网友都有可能继续传播该讯息。若网友选择继续传播，你将会遭受名誉损失-6。你的选择是： [单选题]

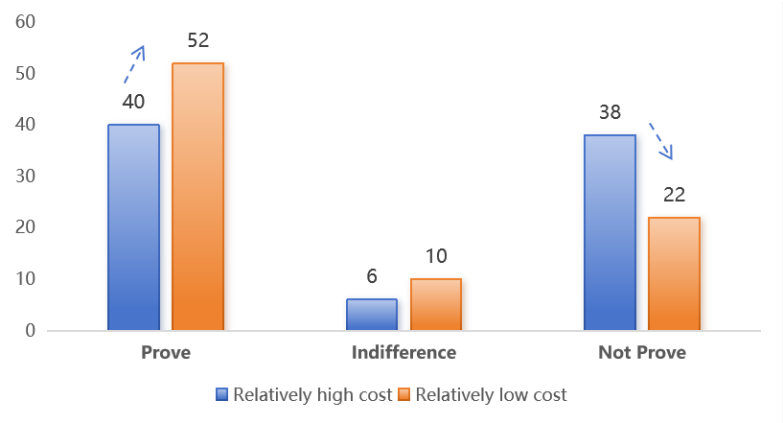


Figure: Privies' reactions when faced with different self-proving costs

The Privy's results

Supervision: Self-proving cost decreases and victims will be compensated.

- The privy is more likely to prove when supervision appears: 42.9%
- The privy is less likely to prove when supervision appears: 11.9%
- Supervision does not affect the privy's choice: 45.2%

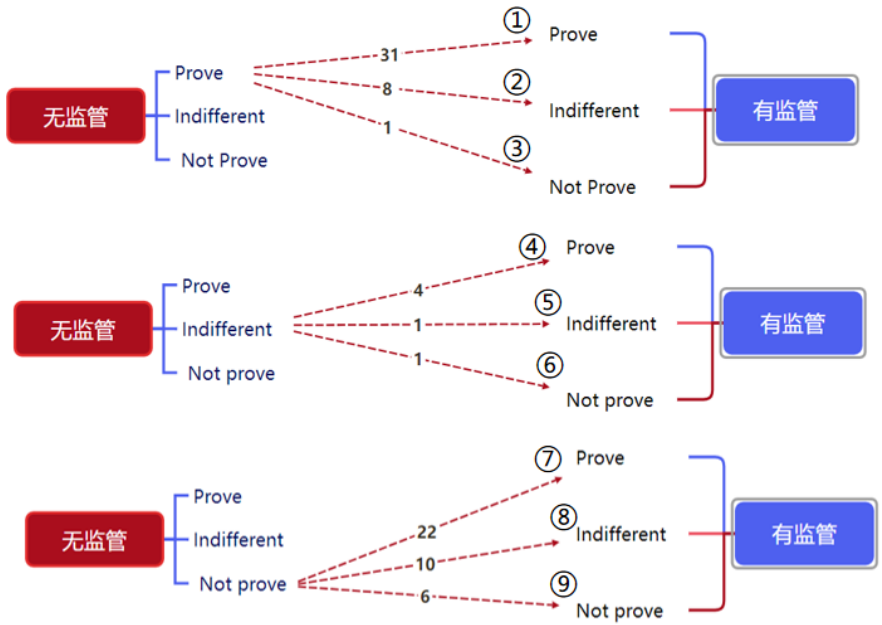


Figure: Privies' reactions between different supervision status

Outline

Summary and reflection

Why are online rumors so prevalent?

- “造谣一张嘴，辟谣跑断腿”: In cyberspace, spreading rumors is almost no cost while the cost of self-proving is so high.
- 舆论场上的“有罪推定”: It is assumed in advance that the Privy has a problem, then he needs to prove ”I’m innocent”.

Policy implications:

- Strengthen supervision: Assist Privies to reduce self-proving costs, and severely punish rumor makers and spreaders.
- Movement: “清朗行动” in 2023

Model limitations:

- Guilty Privies who use ”false evidence” to quibble are not taken into account.
- The influence of Macro Influence on netizens’ actions has been ignored.

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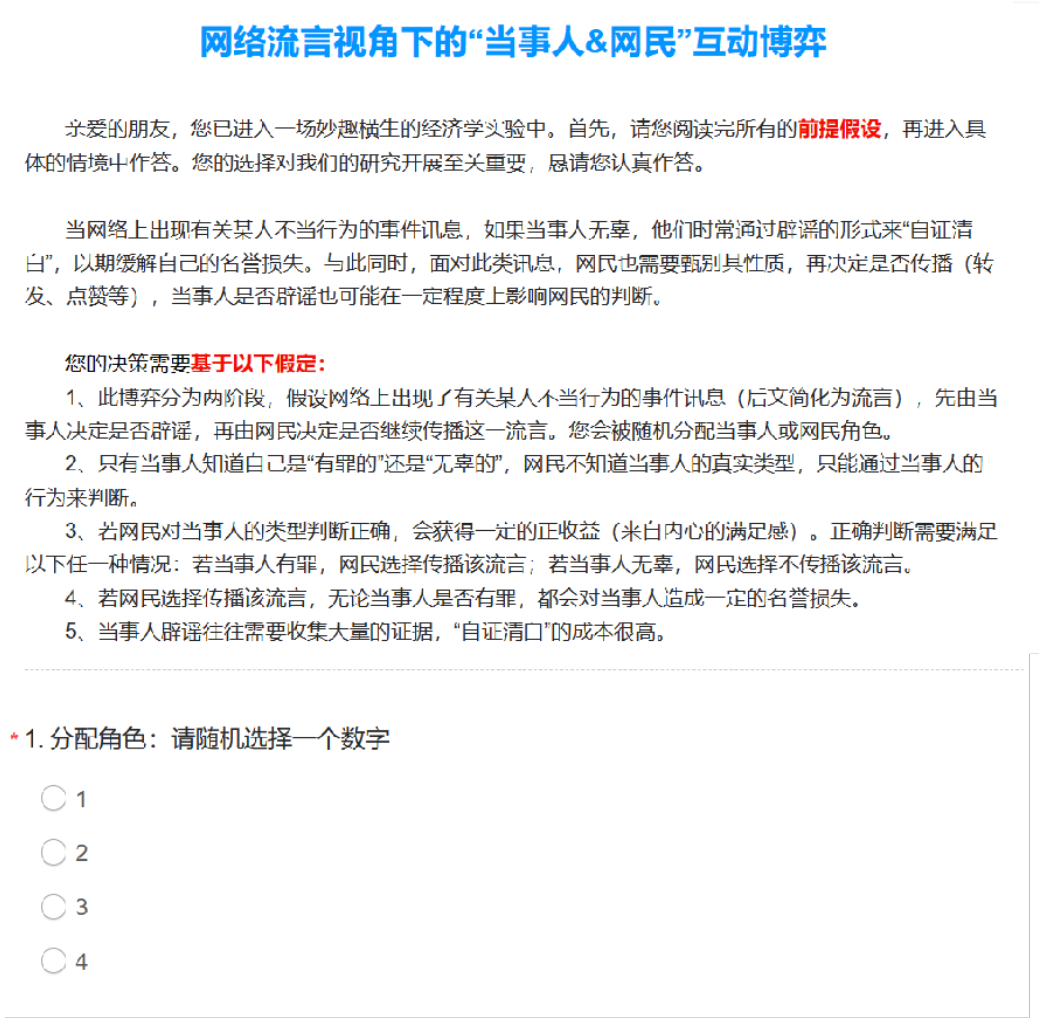
Thank you!

Outline

Questionnaire

- Introduction and assumptions



网络流言视角下的“当事人&网民”互动博弈

亲爱的朋友，您已进入一场妙趣横生的经济学实验中。首先，请您阅读完所有的**前提假设**，再进入具体的情境中作答。您的选择对我们的研究开展至关重要，恳请您认真作答。

当网络上出现有关某人不当行为的事件讯息，如果当事人无辜，他们时常通过辟谣的形式来“自证清白”，以期缓解自己的名誉损失。与此同时，面对此类讯息，网民也需要甄别其性质，再决定是否传播（转发、点赞等），当事人是否辟谣也可能在一定程度上影响网民的判断。

您的决策需要**基于以下假定：**

1、此博弈分为两阶段，假设网络上出现了有关某人不当行为的事件讯息（后文简化为流言），先由当事人决定是否辟谣，再由网民决定是否继续传播这一流言。您会被随机分配当事人或网民角色。

2、只有当事人知道自己是“有罪的”还是“无辜的”，网民不知道当事人的真实类型，只能通过当事人的行为来判断。

3、若网民对当事人的类型判断正确，会获得一定的正收益（来自内心的满足感）。正确判断需要满足以下任一种情况：若当事人有罪，网民选择传播该流言；若当事人无辜，网民选择不传播该流言。

4、若网民选择传播该流言，无论当事人是否有罪，都会对当事人造成一定的名誉损失。

5、当事人辟谣往往需要收集大量的证据，“自证清白”的成本很高。

*1. 分配角色：请随机选择一个数字

1
2
3
4

Questionnaire

- Questions for Privies

* 2. 你的角色是当事人。网络上流传着有关你某一不当行为的讯息，你知道自己的真实类型是"无辜的"。已知"自证清白"的成本为-5，是否辟谣可能会影响网友对待流言的态度。但无论你是否选择辟谣，网友都有可能继续传播该讯息。若网友选择继续传播，你将会遭受名誉损失-4。你的选择是：

- ○ 辟谣
- ○ 不辟谣
- ○ 是否辟谣都一样

* 4. 你的角色是当事人。网络上流传着有关你某一不当行为的讯息，你知道自己的真实类型是"无辜的"。已知"自证清白"的成本为-5，是否辟谣可能会影响网友对待流言的态度。但无论你是否选择辟谣，网友都有可能继续传播该讯息。若网友选择继续传播，你将会遭受名誉损失-6。你的选择是：

- ○ 辟谣
- ○ 不辟谣
- ○ 是否辟谣都一样

Questionnaire

由于网络上流言四起，真伪难辨，严重破坏了网路秩序和公共安全，**政府监管**决定介入。监管介入后，传播虚假讯息的网民会受到一定惩罚（罚金、禁言等），而原本无罪却被网民乱传谣的当事人可以获得一定补偿（金钱、名誉恢复等）。同时，政府部门的协助会降低无罪当事人"自证清白"的成本。政府监管的介入可能会在一定程度上影响当事人和网民的决策。

7. 你的角色是当事人。网络上流传着有关你某一不当行为的讯息，你知道自己的真实类型是"无辜的"。若你选择辟谣，很大概率会引起监管部门的注意，多部门协助将使"自证清白"的成本从-5降至-3。但无论你是否辟谣，网友都有可能继续传播该讯息。若网友选择传播，你将遭受名誉损失-4，同时，受益于监管部门对传谣行为的严厉惩治，将在事后给予你+8的名誉补偿；若网友选择不传播，你需独自承担辟谣成本。在政府监管介入下，你的选择是：

- ○ 辟谣
- ○ 不辟谣
- ○ 是否辟谣都一样

* 8. 你的角色是当事人。网络上流传着有关你某一不当行为的讯息，你知道自己的真实类型是"无辜的"。是否辟谣可能会影响网友对待流言的态度。若你选择辟谣，很大概率会引起监管部门的注意，多部门协助将使你"自证清白"的成本从-6降至-5，同时你将在事后获得名誉补偿+8。但无论你是否选择辟谣，网友都有可能继续传播该讯息。若网友选择继续传播，你仍会因此遭受名誉损失-4。在政府监管介入下，你的选择是：

- ○ 辟谣
- ○ 不辟谣
- ○ 是否辟谣都一样

Questionnaire

- Questions for Internet Users

* 5. 你的角色是网民。你看到一条有关某人不当行为的讯息，且当事人有进行辟谣，此时你需要在继续传播或不传播流言之间做出选择。如果你对当事人的类型判断正确（当事人有罪，你选择传播；当事人无辜，你选择不传播），你会获得收益3；如果你判断错误，你的收益为0。你的选择是：

- ○ 继续传播
- ○ 不传播
- ○ 是否传播都一样

* 6. 你的角色是网民。你看到一条有关某人不当行为的讯息，且当事人没有进行辟谣，此时你需要在继续传播或不传播流言之间做出选择。如果你对当事人的类型判断正确（当事人有罪，你选择传播；当事人无辜，你选择不传播），你会获得收益3；如果你判断错误，你的收益为0。你的选择是：

- ○ 继续传播
- ○ 不传播
- ○ 是否传播都一样

Questionnaire

由于网络上流言四起，真伪难辨，严重破坏了网路秩序和公共安全，**政府监管**决定介入。监管介入后，传播虚假讯息的网民会受到一定惩罚（罚金、禁言等），而原本无罪却被网民乱传谣的当事人可以获得一定补偿（金钱、名誉恢复等）。同时，政府部门的协助会降低无罪当事人"自证清白"的成本。政府监管的介入可能会在一定程度上影响当事人和网民的决策。

* 9. 你的角色是网民。你看到一条有关某人不当行为的讯息，且当事人没有进行辟谣，此时你需要在继续传播或不传播流言之间做出选择。如果你对当事人的类型判断正确（当事人有罪，你选择传播；当事人无辜，你选择不传播），你会获得收益3；如果你判断错误，政府监管介入下你会受到惩罚-5。你的选择是：

- ○ 继续传播
- ○ 不传播
- ○ 是否传播都一样