

Privacy Protection: When Does Hiding in Plain Sight Work?

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Prince Harry and Meghan Markle: In pursuit of privacy

The Guardian, 5 October 2019

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General framework

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Other examples

- | company hiding financial problems
- | central bank hiding the depletion of foreign reserves
- | politician hiding her misdeeds

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Alternative explanations: signaling story, psychological reaction

Literature

- | Privacy as anonymity to avoid price discrimination: Acquisti, Taylor, and Wagman (2016)
- | Intrinsic value of privacy:
 - | Gradwohl (2018) decision making in committees
 - | Dziuda and Gradwohl (2015) interfirm communication to achieve cooperation
 - | Daughety and Reinganum (2010) reputation model: agent wants to hide his action to be perceived as "high" type
 - | Gradwohl and Smorodinsky (2017) signaling games: all types want to hide their actions
- | Law: D. Solove (2007, *San Diego Law Review*) "I've got nothing to hide"
- | Strategic experimentation with Poisson bandits: Keller, Rady and Cripps (2005)

Model

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- | **Hider** publicly commits to the level of protection, **seeker** can undertake a costly search to learn and report a compromising story

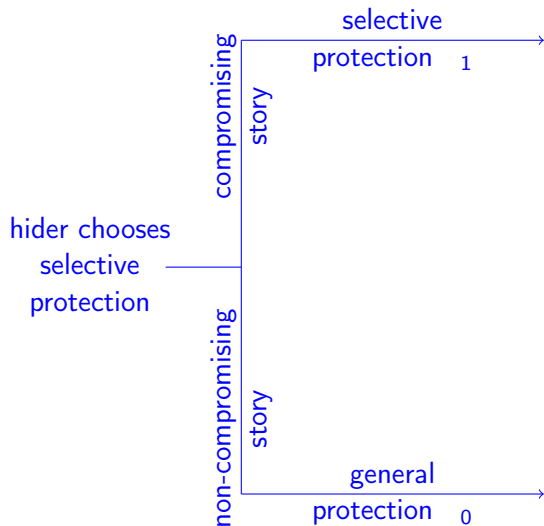
Model

- | **Hider** publicly commits to the level of protection, **seeker** can undertake a costly search to learn and report a compromising story
- | Hider controls **selective protection**
 - | ex: Royal family security protocols, one's habits on social media
- holding **general protection** as given
 - | ex: encryption of data in WhatsApp, US tradition of no trespassing

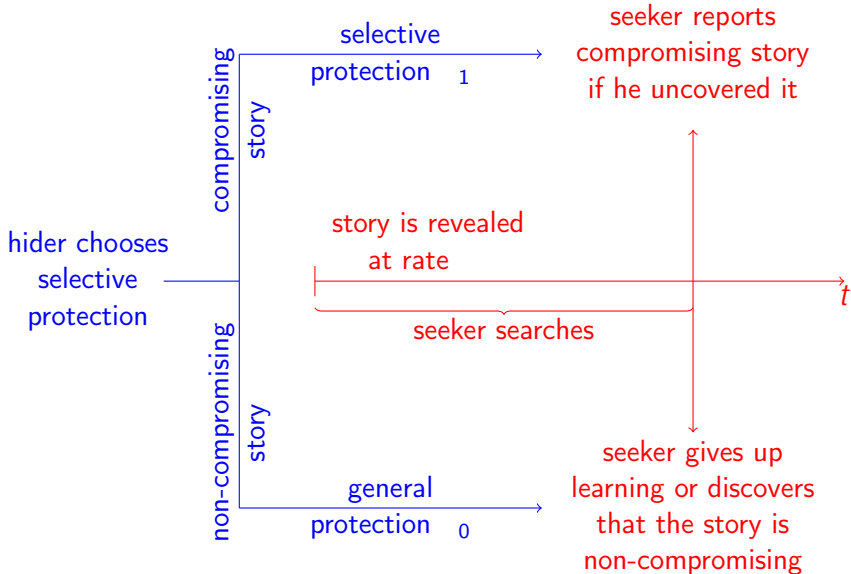
Model

hider chooses
selective
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Assumption

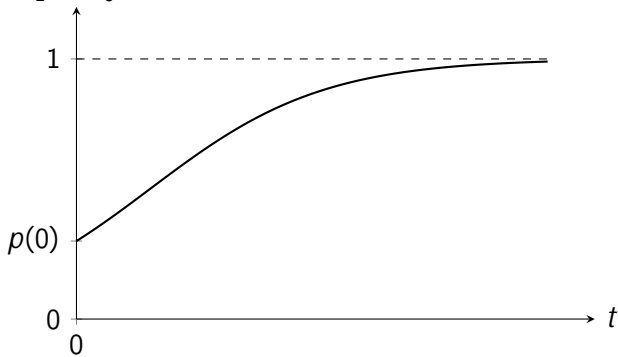
The hider can choose any α_1 such that $\alpha_1 \leq c/p$

Results

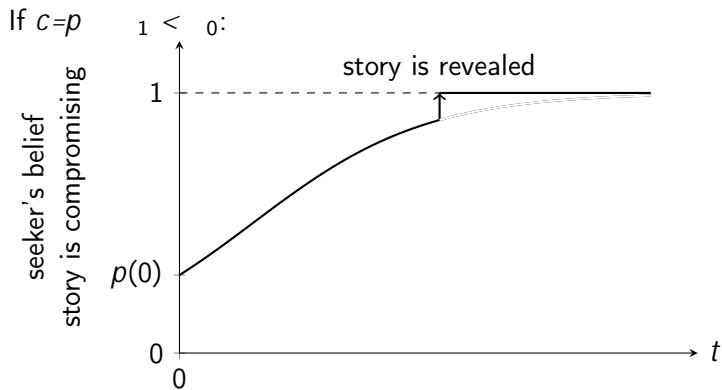
If $c=p$

$1 < 0$:

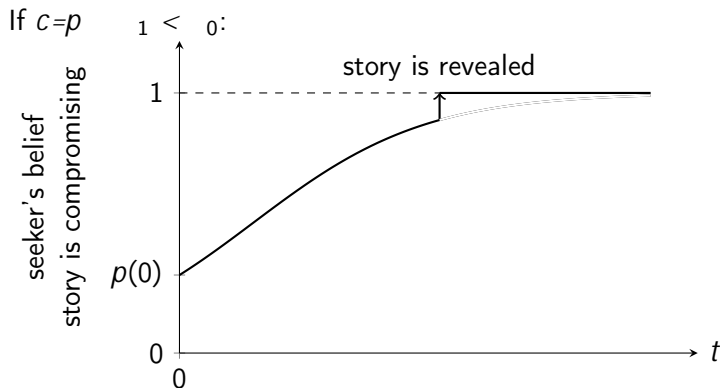
seeker's belief
story is compromising



Results



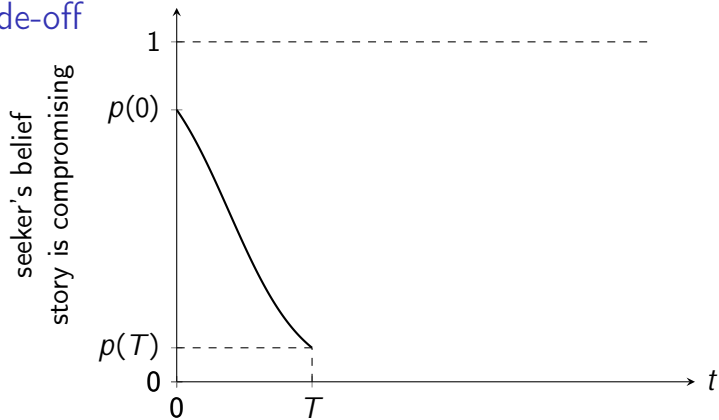
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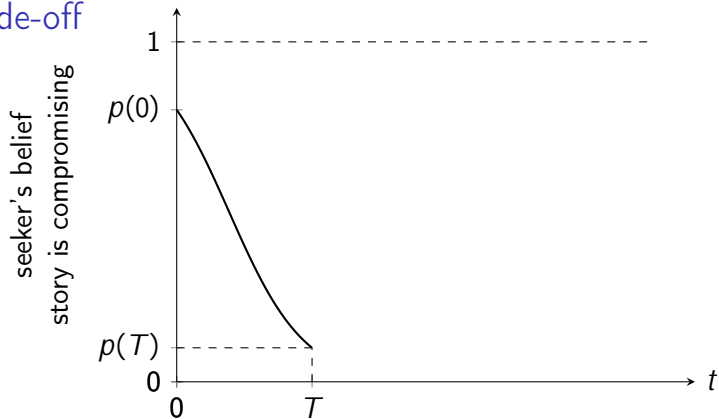
Main result

If $0 > c=p$ (general protection is weak), then the hider will not choose the strongest feasible selective protection.

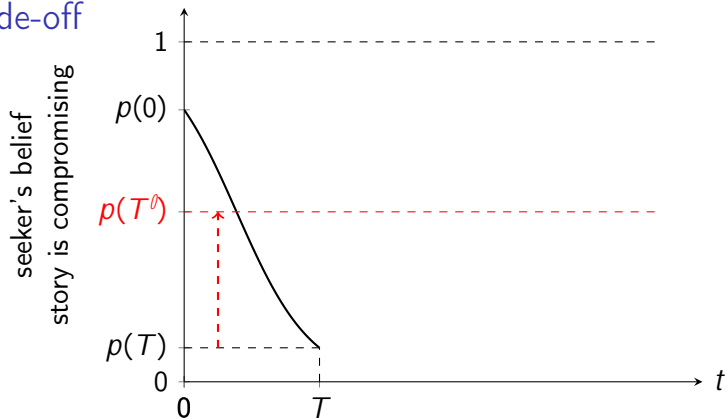
Trade-off



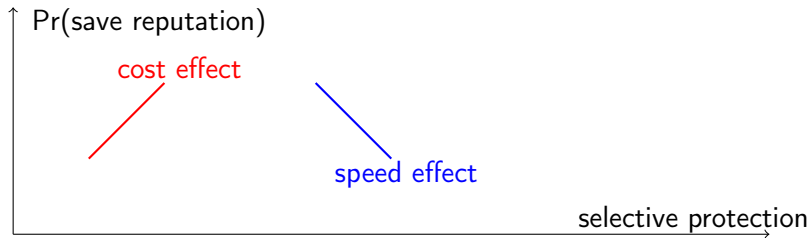
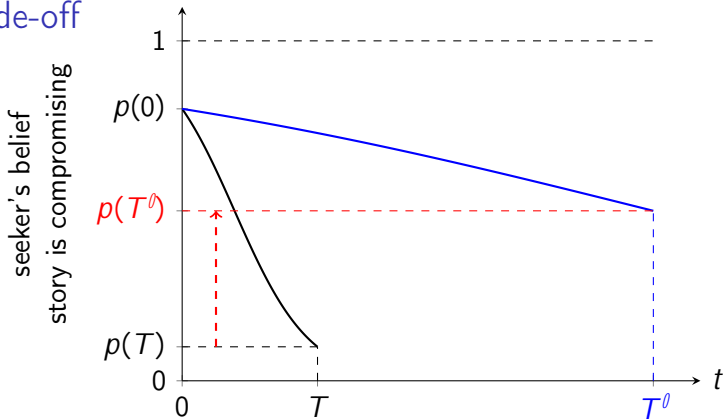
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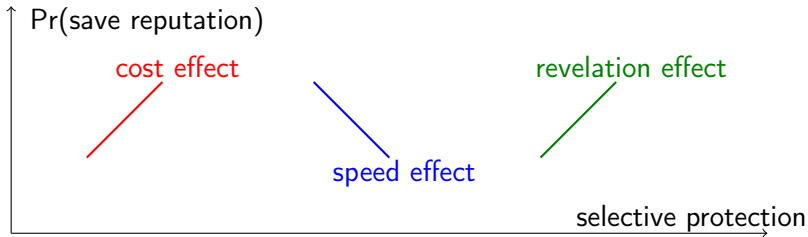
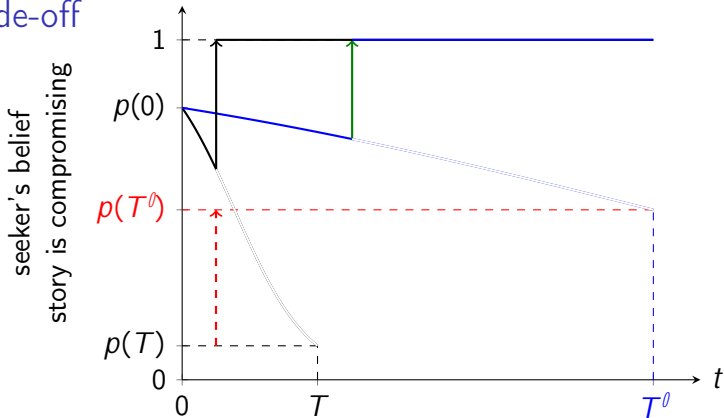
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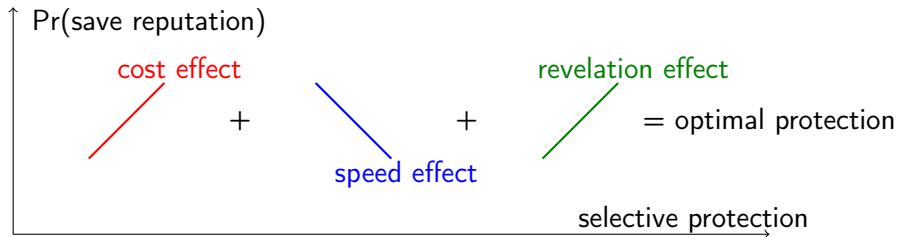
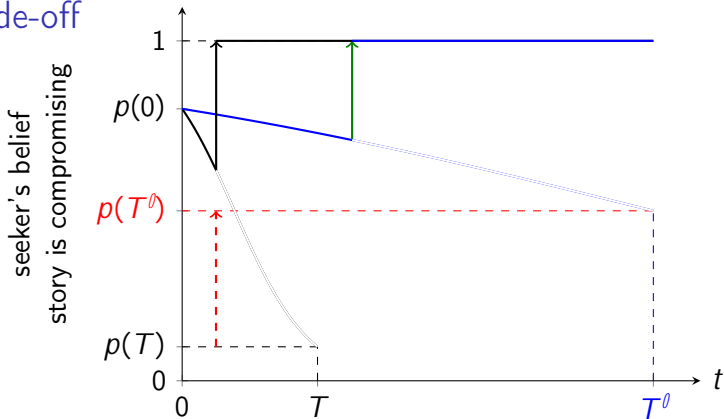
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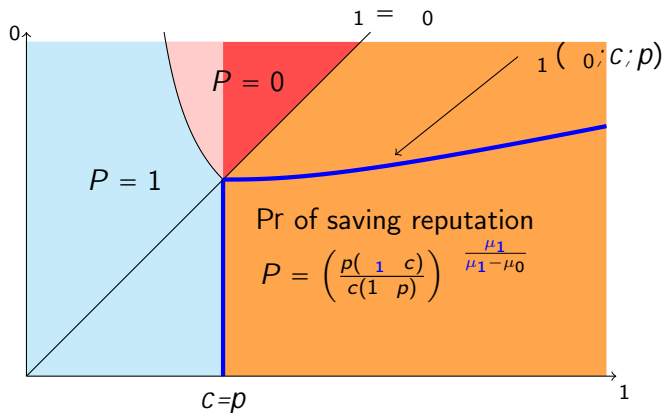


Optimal Protection

Theorem

Under assumption $\mu_1 < c = p$, the optimal selective protection is characterized by μ_1 , which is a function of μ_0 , c , and p . If

$\mu_0 < c = p$, then $\mu_1(\mu_0; c; p) = c = p$. If $\mu_0 > c = p$, then $\mu_1(\mu_0; c; p) > \mu_0$ uniquely solves $\ln\left(\frac{p(\mu_1 - c)}{c(1 - p)}\right) - \frac{1(\mu_1 - \mu_0)}{\mu_0(\mu_1 - c)} = 0$.



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$\pi_1(c_0; c; p)$ balances *Speed* vs *Duration* of learning

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Prior Belief

$\pi_1(\theta_0; c; \rho)$ is increasing in ρ .

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General Protection

$\pi_1(\theta_0; c; p)$ is increasing in θ_0 .

- | " θ_0) \neq speed of learning) " π_1 to increase speed
- |) general and selective types of protection are *complements*

Privacy Debate

- | general protection (all information) — government responsibility
- | selective protection (only sensitive information) — individual responsibility

Goal protection of sensitive information

Problem General protection has high indirect cost since it limits access to big data

Your individual data is actually not that valuable. While the entire data market might be worth \$3trn... it's access to huge aggregate data that is valuable.

Privacy International

Question Could providing tools for selective protection be a solution?

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Question Could providing tools for selective protection be a solution?

Answer **No!** Tools that facilitate selective protection might not be used in practice in the absence of good general protection.

Extension: Many Seekers

- | Suppose the hider cannot control β_1 but can choose the number of seekers $n \geq 1$.
- | Private learning: the seekers do not communicate with each other
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Theorem

Under assumption $\beta = c = p$, the optimal privacy protection is $n = + \infty$, that is, open access is optimal.

- | speed effect always gets an upper hand over revelation effect
 - | this is not true if there is discounting

Sometimes the best hiding place is the one that's in plain sight.

Stephenie Meyer



A vampire family was hiding in plain sight (e.g. go to school) all along and nobody figured that out...