SI 680 - Contracting and Signaling, Winter 2008

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<http://hdl.handle.net/2027.42/64965>
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Playlist

“That’s Incentive”, Death Cab for Cutie
“The New Pollution”, Beck
“Signal”, Laura Jansen
“Screen”, Brad
“Contribution”, Jurassic 5
“Bargain”, The Who
Signaling

Jeff MacKie-Mason

SI 680: Information Economics
Some applications

- Health insurance
- Graduate school applicants (U cares about reputation)
- Social clubs
- Marriage
- Professional contractors
- Product sellers
- Political candidates
What's the problem?

Good types want you to know they are good. Why is the “good” characteristic hidden?

Well...the bad types also want you to know that they are “good” 😊
“The truth is only half of what is needed; the other half is called believability.”

- J. Saramago
How to signal that you are high quality?
Do something a weak firm would not do
Suppose: Entrepreneur agrees to pay a fine if startup goes bankrupt
How?
For example, pledge house as collateral
Then, high debt level signals a good firm!
High debt costs more to owner of poor firm
Recall Ferguson

- Used personal wealth for original financing
- Willing to give up consulting to be full-time
Why might low entry pricing signal a good firm?
Consumers will find out if goods are low quality, and won’t buy many in future.

- Low initial pricing won’t be made up later if product quality is low.

- High quality products will make up for early discounts through higher sales at higher prices later.
Signaling: Agent chooses action before contract offered.

Screening: Contract offered, specifies screen action that agent must perform.
Human spit contains 1,116 unique proteins

news.yahoo.com — U.S. researchers have identified all 1,116 unique proteins found in human saliva glands, a discovery they said on Tuesday could usher in a wave of convenient, spit-based diagnostic tests that could be done without the need for a single drop of blood. More... (General Sciences)

See The World's Lightest Cell Phone

huffingtonpost.com — The Guinness World Records named the Modu phone as the lightest cell phone in the world. At just 1.5 ounces and 2.8 by 1.4 by 0.3 inches, the Modu is a full ounce lighter than the already miniature Pantech C300. Without a doubt, it's the tiniest cell phone I've seen outside of Zoolander. More... (Gadgets)
Users post stories:
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- Two types, **Truth-tellers and Liars** ($\tau \in \{T, L\}$)
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- Fraction $\rho$ are $\tau = T$
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- Fraction $p$ are $\tau = T$
- Contributors experience posting benefits $\{v_T, v_L\}$
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- Fraction $p$ are $\tau = T$
- Contributors experience posting benefits $\{v_T, v_L\}$

Digg benefits $\pi_T > \pi_L$ from each contribution ($\pi_L < 0$ permissible)
Simple proposal

(UCC metadata)
Simple proposal

Collect “deposit” for every story posted, $\phi$
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Invite readers to vote on story’s truthfulness; calculate score $\rho(# \text{ votes}, # \text{ false})$, e.g.,

$$\rho = \begin{cases} 
1 & \text{if } N < 20 \\
\frac{T}{T+L} & \text{if } N \geq 20 
\end{cases}$$
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After some time, Digg returns deposit if $\rho > \bar{\rho}$, with $\bar{\rho}$ set in advance by Digg.
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After some time, Digg returns deposit if $\rho > \bar{\rho}$, with $\bar{\rho}$ set in advance by Digg.

Digg chooses $\{\phi, \bar{\rho}\}$ to maximize its value
Assume $\rho_\tau \sim f(\mu_\tau, \bar{\sigma}^2)$, with

- $\mu_T > \mu_L$
- cdf is $F_\tau(\rho)$
Signal distribution

Assume \( \rho_\tau \sim f(\mu_\tau, \bar{\sigma}^2) \), with

- \( \mu_T > \mu_L \)
- cdf is \( F_\tau(\rho) \)

Then \( \Pr(\rho \leq \bar{\rho} | \tau) = F_\tau(\bar{\rho}) \), which is the probability of losing deposit

\[ F_L(\bar{\rho}) \geq F_T(\bar{\rho}) \]
Optimization problem Users get \( EU_\tau = v_\tau - \phi F_\tau(\bar{\rho}) \)

Digg solves

\[
\max_{\bar{\rho}, \phi} p(\pi_T + \phi F_T(\bar{\rho})) + (1 - p)(\pi_L + \phi F_L(\bar{\rho}))
\]
Optimization problem Users get $EU_\tau = v_\tau - \phi F_\tau(\bar{\rho})$

Digg solves

$$\max_{\bar{\rho}, \phi} p(\pi_T + \phi F_T(\bar{\rho})) + (1 - p)(\pi_L + \phi F_L(\bar{\rho}))$$

s.t. \quad v_T - \phi F_T(\bar{\rho}) \geq 0 \quad \text{(particip. constraints)}

\quad v_L - \phi F_L(\bar{\rho}) \geq 0

if both types $\tau \in \{T, L\}$ are participating
Result 1
If $\pi_L + \nu_L < 0$ then set $\phi \bar{p}$ high enough to exclude participation by Liars.

Occurs if the contribution is sufficiently polluting ($\pi_L < -\nu_L$).
Result 2
If $\pi_L + \nu_L > 0$, then set $\phi\tilde{p}$ so that polluters just willing to participate

Digg collects all of their surplus.
Why ever let Liars participate?
And why when polluting:

\[ v_L > -\pi_L > 0? \]
Digg may get negative value from content...
...but willing to publish if price is right