Privacy and Behavioral Economics: From Discounting the Past to the Illusion of Control

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TODAY'S POLL ✛

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News

The ladettes who glorify their shameful drunken antics on Facebook

By ANDREW LEVY - More by this author »
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Drunkenly dancing on tables or collapsing in the street used to be a source of acute embarrassment for young women the morning after the night before.

Today, they are more likely to boast about it - to the world, with pictures - on social networking sites.

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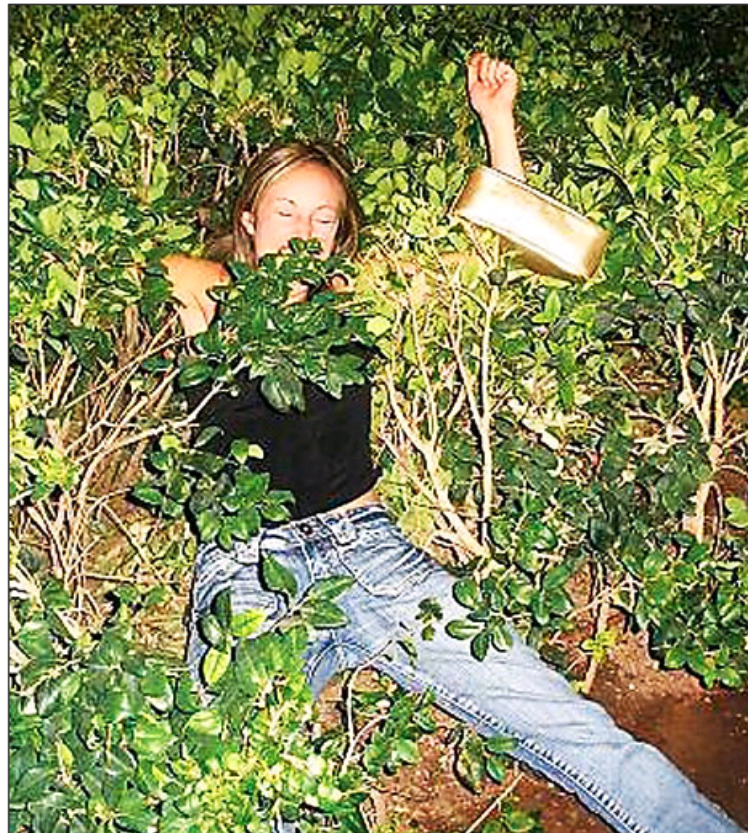
Dec 6 2007 11:48 AM EST

Facebook Founder Apologizes For Beacon, Allows Users To Turn Off Program Entirely

'We've made a lot of mistakes building this feature,' writes Mark Zuckerberg in a blog post.

By Gil Kaufman

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Photo: Chris Jackson/Getty Images

Facebook founder Mark Zuckerberg apologized to the site's users in a blog post on Wednesday for the way in which controversial new ad feature Beacon was rolled out last month and promised that users can now turn off the program if they want to. "We've made a lot of mistakes building this feature, but we've made even more with how we've handled them," wrote Zuckerberg of the program, which tracks the online activities of its users on other Web sites and sends that information to their friends.

But after more than 50,000 users signed an online petition complaining that Beacon was invasive and could broadcast information they preferred to keep private, the company announced last Thursday that it would make the warnings about the program more prominent. Then on Wednesday, Facebook released the feature users had asked for: a privacy control that can turn Beacon off completely.

"We simply did a bad job with this release, and I apologize for it," Zuckerberg said. "While I am disappointed with our mistakes, we appreciate all the feedback we have received from our users. I'd like to discuss what we have learned and how we have improved Beacon."

The company's founder explained that Facebook had wanted Beacon to be simple enough to let users share information across sites with friends, but lightweight enough to not get in their way as they browsed the Web.

"We were excited about Beacon because we believe a lot of information people want to share isn't on Facebook, and if we found the right balance, Beacon would give people an easy and controlled way to share more of that information with their friends," he explained. The mistake the company made, he admitted, was that in making Beacon an "opt-out system instead of opt-in," so that if someone forgot to decline to share something, Beacon still went ahead and shared it with their friends. In the end, he said, once Beacon was rolled out on November 6 and people started to complain, it took Facebook too long to find the right solution to users' complaints.

Contrasting needs

- Contrasting (yet co-existing) human needs
  - Need for privacy
  - Need for publicity
    - Even *bad* publicity
- An issue of control...
- ... that is, economic *signaling*

Agenda

1. From the economics of privacy, to the behavioral economics of privacy
2. Two recent studies
   - Discounting the past
   - The illusion of control

The evolution of the economics of privacy

- *Protection & revelation of personal data flows involve **tangible and intangible** trade-offs for the **data subject** as well as the potential **data holder***

- Early 1980s
  - The Chicago school approach (Posner 1978, Stigler 1980, …)

- Mid 1990s
  - IT explosion (Varian 1996, Noam 1996, Laudon 1996, …)

- After 2000
  - Formal microeconomic models (Acquisti & Varian 2001, Taylor 2001, Calzolari & Pavan 2001, Katz & Hermalin 2003,…)

However: Privacy attitudes vs. behavior

- **Attitudes about privacy**
  - (Ostensibly,) top reason for not going online… (Harris Interactive)
  - Billions in lost e-tail sales… (Jupiter Research)
  - Significant reason for Internet users to avoid Ecommerce… (P&AB)
- **Actual behavior**
  - Dichotomy between privacy attitudes and privacy behavior
    - Spiekermann *et al.* 2001, Acquisti & Gross 2006's Facebook study

- **A privacy paradox!**

Do people really care for privacy?
If they do, can they act on their concerns?
If they don't (or can't), should policy-makers do so on their behalf?

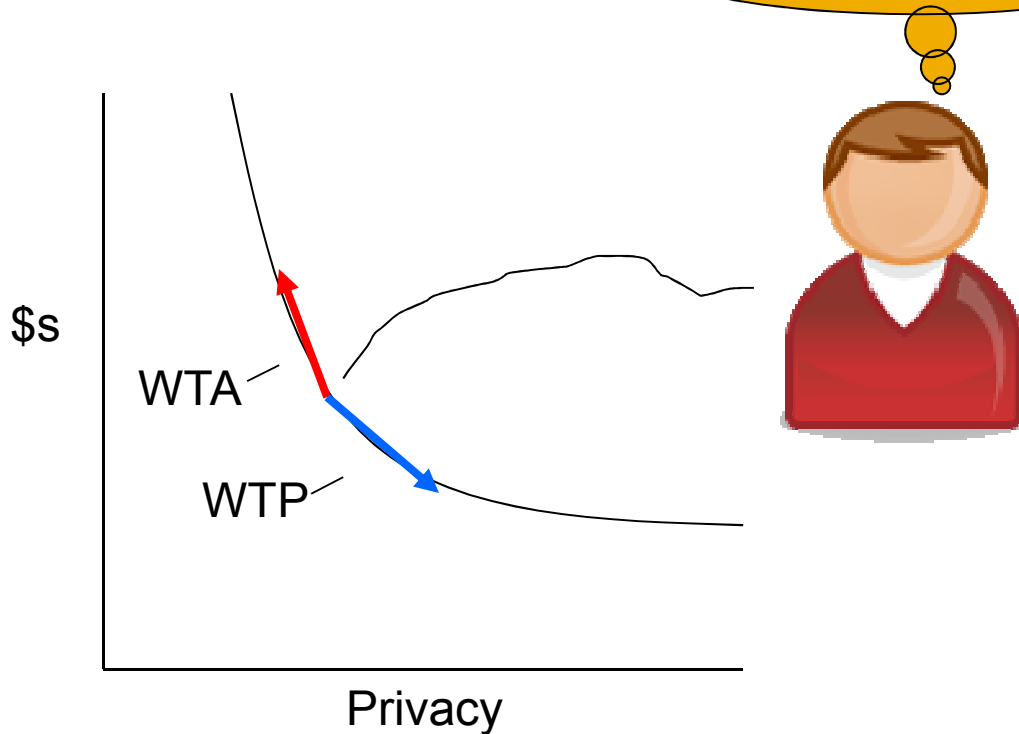# A rational model of privacy decision making

A rational model of privacy decision making

Maybe I'll find a lover... But what about my future job prospects? And what if my parents happen to log on...

A rational model of privacy decision making

$$\sum p_i \sum \frac{1}{(1+d)^t} u(benefits_{it}) - \sum q_i \sum \frac{1}{(1+d)^t} u(costs_{it})$$

$s

WTA

WTP

Privacy

Why is privacy decision making hard?

Free Giveaway!

Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Home Phone: _____

Work Phone: _____

❑ Single   ❑ Married

Age: _____ Occupation: _____

Spouses Age: _____ Occupation: _____

Combined Income:
❑ Under $30,000   ❑ Over $30,000   ❑ Over $50,000

DO YOU: ❑ RENT OR ❑ OWN   YOUR HOME?

❑ VISA   ❑ MASTERCARD   ❑ AMERICAN EXPRESS

Would you like info on special events & promotions at Pier 39?

❑ Yes   ❑ No

E-mail address: _____

Details of Participation and Eligibility Requirements

- Only one Entry per Family.

- Winner allows the use of his or her name, photo, and statements for future promotional use without further compensation.

- Winner must be 18 or over. I.D. required. Winner must provide all necessary federal and state tax reporting information before receiving prizes.

- Drawing held February 23, 2003. Last date to enter drawing is February 16, 2003.

- Winner need not be present to win. Winner will be notified by phone.

- Drawing will be conducted by a Certified Public Accounting Firm at the corporate office of Grand Pacific Resorts, 5900 Pasteur Ct., #200, Carlsbad, CA 92008. To request winner information, correspondence may be forwarded to Grand Pacific Resorts, Promotions Dept. P.O. Box 4068, Carlsbad, CA 92018.

- All local, state, and federal taxes, fees and licenses are the winner's responsibility. Acceptance of the prizes constitutes a release of Facility Management, it's agents and employees from all responsibility to the winner.

- Odds are based on number of entries received, approximately 1 in 700,000.

- No purchase or attendance is necessary to be entered into the drawing. Entrants may be invited to attend a sales presentation about the Red Wolf Lodge in Squaw Valley.

- Entries become the property of PNR Marketing Inc.

- The annual "Grand Prize" Giveaway consists of any vehicle with a retail value not to exceed $25,000 or a three year lease (value to $25,000) on a luxury car; or any prize (or similar) displayed in a Grand Pacific Resorts Promotion February 25, 2002 - February 23, 2003 (valued up to $15,000), or the winner may choose cash in the amount of $15,000.

Hurdles which hamper (privacy) decision making

1. Incomplete information
2. Bounded rationality
3. Cognitive/behavioral biases

The behavioral economics of privacy

- Behavioral experimental economics has uncovered evidence for several systematic "deviations" from the theoretical rational behavior of the economic agent

- Many of those deviations have applications to the privacy arena (as well as information security)

- *Hence, the need arises for the application of <u>behavioral experimental</u> economics to the understanding of privacy decision making*

The behavioral economics of privacy

- The behavioral economics of privacy is about applying theory and methodologies from BE and BDR to the understanding of how people make decisions about the security or privacy of their data

- … and how cognitive and behavioral biases (negatively) affect those decisions

- … in order to inform policy and technology design

Methodological approach

- Hypotheses usually driven from BE and BDR theory

- Randomized experiments
  - Randomly assigning subjects to different experimental conditions (e.g., different versions of a survey)

- Privacy concerns are a latent unobservable variable. We look at manifest variables likely correlated
  - E.g., privacy-sensitive choices, willingness to share private information, **likelihood to answer sensitive questions**
    - See survey design (e.g. Schwarz 1999); self-disclosure (e.g. Altman and Taylor 1973); privacy and disclosures (e..g, Margulis 2003); privacy concerns (e.g., Culnan and Armstrong 1999); ...

Methodological approach

- Numerous unobservable factors impact privacy concerns (and therefore observable behavior)

  - Assumption: with large enough sample and proper randomization, underlying distributions of traits (including privacy preferences, concerns, and other factors which influence the former) are similarly distributed across conditions

    - Also: control econometrically for other observable traits

- Testing for statistically significant differences in behavior as function of treatment

  - Although we cannot interpret micro motivations (e.g., infer who is lying or why a subject is/is not answering), we can compare aggregate behaviors

The behavioral economics of privacy

- Some previous and ongoing results (2004-2009)

    - Hyperbolic discounting in privacy valuations (ACM EC 04)

    - Over-confidence, optimism bias in personal disclosures (WPES 05)

    - Confidentiality assurances inhibit information disclosure (JDJM 07)

    - Individuals more likely to disclose sensitive information to unprofessional sites than professional sites (JDJM 07)

    - …

Two recent (set of) studies

1. ## Discounting the Past

   - About the impact on *others* of one's personal information

   - With Laura Brandimarte and Joachim Vosgerau

2. ## The Illusion of Control

   - About the propensity to reveal personal information

   - With Laura Brandimarte and George Loewenstein

Discounting the past

- *In November 2006 , two Ottawa employees of a grocery store chain made admissions of theft on the message board of a Facebook group.*
  In January 2008 they were fired after their new employer found out about the message.

- *About two years ago, two users created a Facebook page for "Keep A Child Alive," a nonprofit organization that helps provide drugs for people, living in Africa and India, who are affected by AIDS.*
  There was no consequence for those users from the creation of this page.

Discounting the past

- How does information related to past events and retrieved today get discounted?

- Does information about a person's past with negative valence receive more weight in impression formation than information with positive valence?

Introducing differential discounting

What the literature focused on (e.g., Brickman et al., 1978):
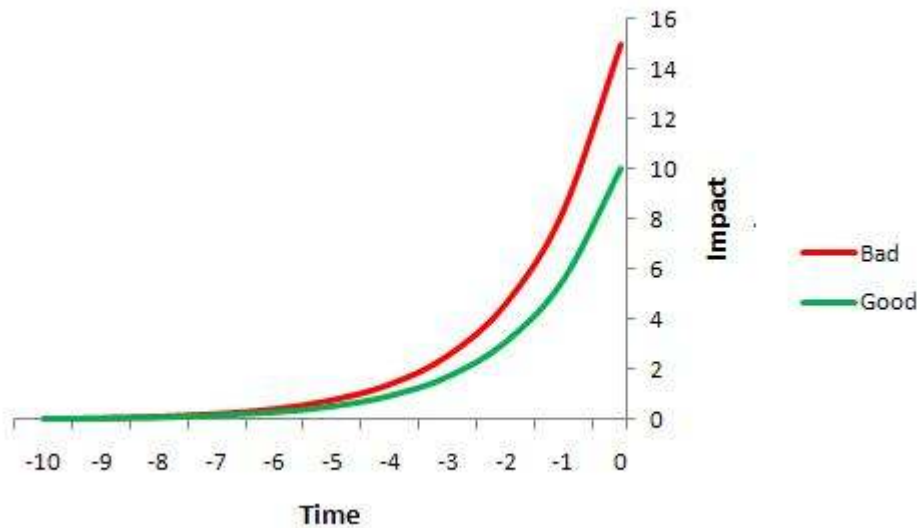
We introduce the hypothesis of **differential discounting**:
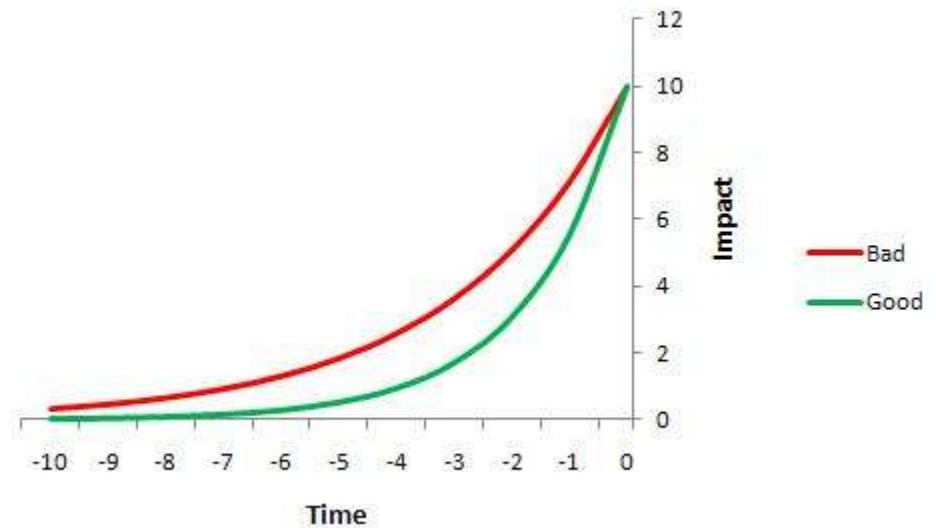
Hypothesis

- Impact of information with negative valence lasts longer than impact of info with positive valence, not only because of asymmetric effects of valence, but also because of different weights – or discount rates – applied to the two types of info

- This may be due to
    - Mobilization effects (Taylor, 1991) and evolutionary theory (Baumeister et al., 2001)
    - Negativity bias (Seligman and Maier, 1967)
    - Negative info is more attention grabbing (Pratto and John, 1991)

Three experiments

- We ran three survey-based randomized experiments, manipulating **valence** of information provided to subjects and **time** to which that information referred
  - **The dictator game**
  - **The wallet story**
  - The company story

- All subjects received the same baseline information about a person or a company
  - Subjects in the neutral conditions only received baseline info

- Then subjects were asked to express a judgment on the person or company they just read about

First experiment: The dictator game

- **Hypothetical scenario**: subjects are to decide how they would split $100 with another player – the opponent
- **Priming subjects** on what to consider a fair split: subjects are instructed that on average dictators keep for themselves 70% of the sum
- **Experimental manipulations** of valence and time
  - The opponent is described as having played as the dictator in 7 previous rounds in the 7 previous weeks
  - Allocations were all average (~ 70-30 split) except one, which was:
    - either generous (50-50 split, good info conditions) or unfair (100-0 split, bad info conditions)
    - and occurred either 6, or 4, or 2 weeks ago (old, middle and recent conditions respectively).
- **Neutral condition**: all allocations were fair

Good old condition

Alpha's previous decision on how to split the sum of $100

	To Himself	To you
7 Weeks ago	72	28

Good old condition

Alpha's previous decision on how to split the sum of $100

	To Himself	To you
7 Weeks ago	72	28
6 Weeks ago	**50**	**50**

Good old condition

Alpha's previous decision on how to split the sum of $100

	To Himself	To you
7 Weeks ago	72	28
6 Weeks ago	50	50
5 Weeks ago	**69**	**31**

Good old condition

Alpha's previous decision on how to split the sum of $100

	To Himself	To you
7 Weeks ago	72	28
6 Weeks ago	50	50
5 Weeks ago	69	31
4 Weeks ago	70	30
3 Weeks ago	71	29
2 Weeks ago	68	32
1 Week ago	**70**	**30**

Good middle condition

Alpha's previous decision on how to split the sum of $100

	To Himself	To you
7 Weeks ago	72	28
6 Weeks ago	69	31
5 Weeks ago	70	30
4 Weeks ago	50	50
3 Weeks ago	71	29
2 Weeks ago	68	32
1 Week ago	**70**	**30**

Good recent condition

Alpha's previous decision on how to split the sum of $100

	To Himself	To you
7 Weeks ago	72	28
6 Weeks ago	69	31
5 Weeks ago	70	30
4 Weeks ago	71	29
3 Weeks ago	68	32
2 Weeks ago	50	50
1 Week ago	**70**	**30**

Bad old condition

Alpha's previous decision on how to split the sum of $100

	To Himself	To you
7 Weeks ago	72	28
6 Weeks ago	100	0
5 Weeks ago	69	31
4 Weeks ago	70	30
3 Weeks ago	71	29
2 Weeks ago	68	32
1 Week ago	70	30

Bad middle condition

Alpha's previous decision on how to split the sum of $100

	To Himself	To you
7 Weeks ago	72	28
6 Weeks ago	69	31
5 Weeks ago	70	30
4 Weeks ago	100	0
3 Weeks ago	71	29
2 Weeks ago	68	32
1 Week ago	**70**	**30**

Bad recent condition

Alpha's previous decision on how to split the sum of $100

	To Himself	To you
7 Weeks ago	72	28
6 Weeks ago	69	31
5 Weeks ago	70	30
4 Weeks ago	71	29
3 Weeks ago	68	32
2 Weeks ago	100	0
1 Week ago	**70**	**30**

Dependent variables

- **Dependent variables:**
  - money allocation between subjects and their opponents
  - fairness assessment of their opponents

- We expected the slope of the line describing average allocations to be smaller in absolute value for bad info conditions than for good info conditions

- _Note_: For all experiments, DV is not expressed in levels, but it's the absolute difference between values in each condition and the average value of the neutral condition

Results

Figure 4. Average sum that subjects chose to allocate to themselves in the dictator game
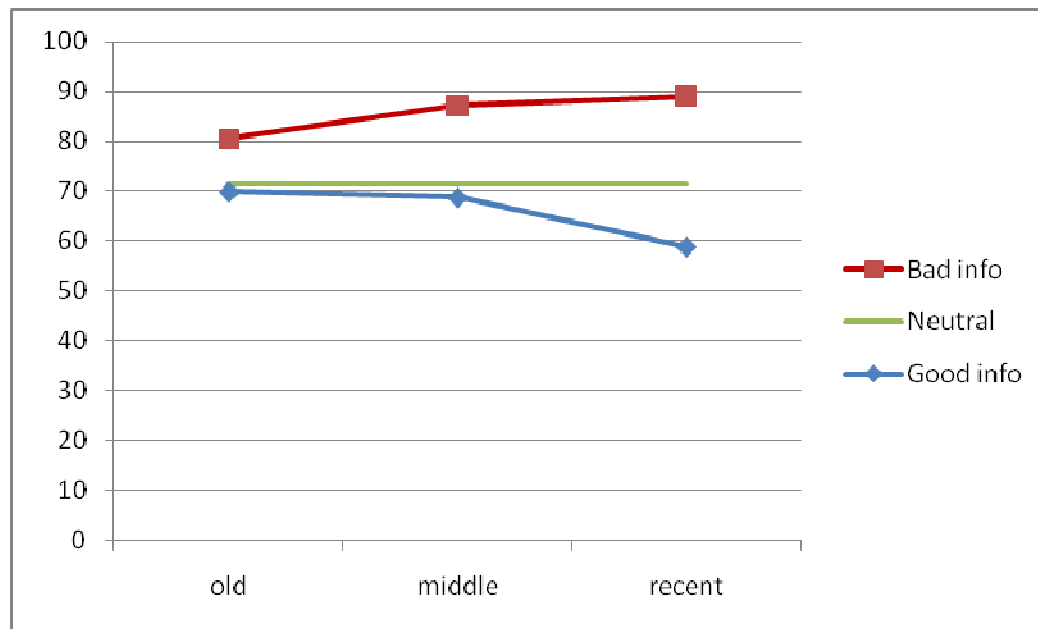
- Based on pair-wise t-tests, good information allocations do not differ from the neutral allocation except for the recent condition

- On the other hand, all bad information allocations differ significantly from the neutral allocation

Second Experiment: The wallet story

- **Hypothetical scenario**: subjects are to express a judgment on a person based on background information we provide

- **Neutral condition**: only baseline info is provided

- **Experimental manipulations** of valence and time: we add to the baseline info one detail with either positive or negative valence, and vary the time to which that detail refers

Here is some background information about Mr. A. Please review this information, and be ready to answer the questions below and in the next page.

Mr. A was born in San Diego, California, where he attended elementary and middle school. As a child, he obtained his social security number and received the standard DPT vaccination.

When he was 16 years old, he moved to Sacramento, California, with his family. He attended high school there and got his driving license.

Just about graduation, he found a lost woman's purse containing $10,000 in cash. He reported [did not report] the discovery to the police, and the rightful owner retrieved [did not retrieve] her money.

*After graduation he moved to Houston, Texas where he has been living and working for the **past 12 months [5 years]**.*

Dependent variables

- **Dependent variables:**
  - How much subjects liked the person described; how they would have liked to work with her (Interpersonal Judgment Scale, Byrne 1961)

Results

Figure 6. Average level of liking and trust indices across conditions in Experiment 2
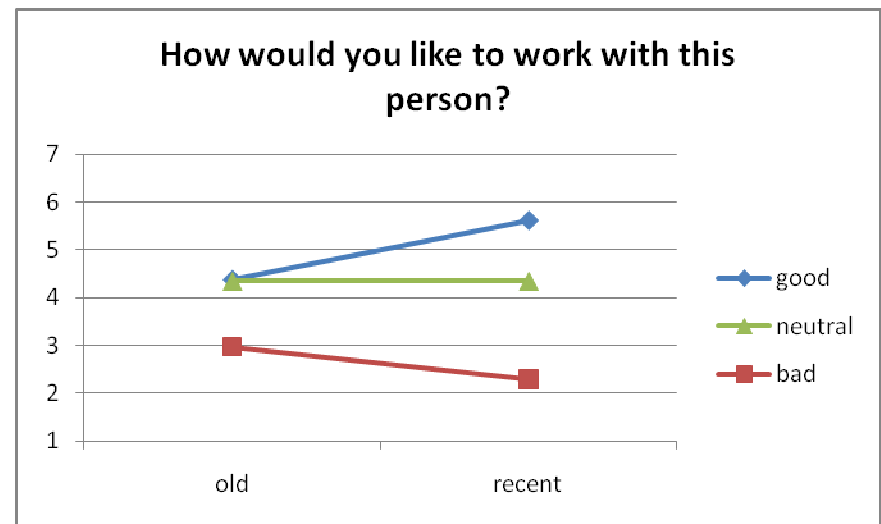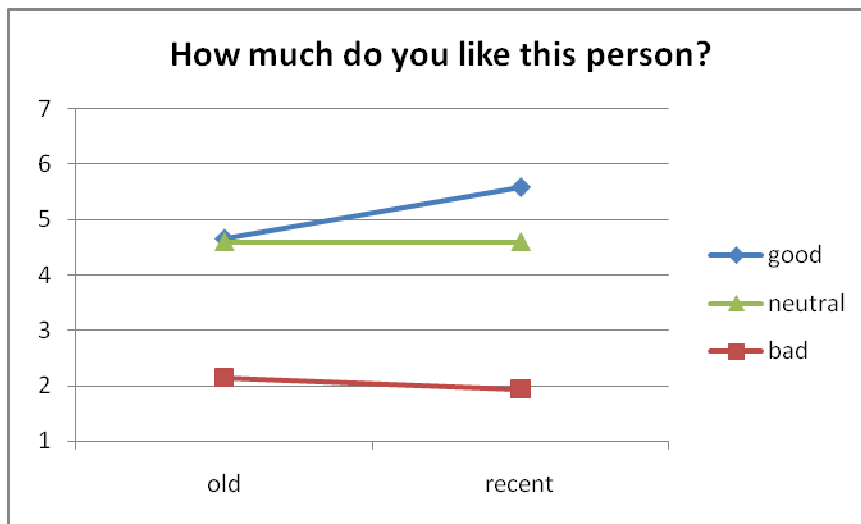
Summarizing the results

- Bad is not just stronger than good…

- …. It is also discounted differently than good

- Implications: future impact of information revealed today

Privacy and (the illusion of) control

Control :: Privacy

<

The Illusion of control hypothesis

- *Users with more [less] control over disclosure and publication of personal information, but less [more] control over access and use of that information, disclose more [less] sensitive information, relative to status quo*
  - Even though objective privacy costs derive from access to/use of information by others

- Conjecture: Individuals may confound control over **publication** of private information with control over **access/use** of that information by others

- Why?
  - Saliency of act of publishing, Overconfidence
  - See Henslin 1967, Langer 1975

Three survey-based randomized experiments

- Experiment 1: Reducing perceived control over publication of personal information
  - Mediated vs. unmediated publication

- Experiment 2: Reducing perceived control over publication of personal information
  - Certainty vs. probability of publication

- Experiment 3: Increasing perceived control over publication of personal information
  - Explicit vs. implicit control

Three survey-based randomized experiments

- Experiment 1: Reducing perceived control over publication of personal information
  - Mediated vs. unmediated publication

- **Experiment 2: Reducing perceived control over publication of personal information**
  - **Certainty vs. probability of publication**

- **Experiment 3: Increasing perceived control over publication of personal information**
  - **Explicit vs. implicit control**

Experiment 2

- Design
  - Subjects: students recruited on campus
  - Online survey
  - Justification for the survey: creation of CMU networking website
  - Questions focused on students' life on and off campus
    - Multiple choice, Yes/No, Rating and open-end questions
    - Included quasi-identifiers + privacy intrusive and non-intrusive questions
      - As rated by 31 subjects independently in a pre-study

Experiment 2

- **Dependent variables**
  - Response rate (whether subject answered or not: White 2004)

- **Explanatory variables**
  - Experimental treatment
  - Intrusiveness

Experiment 2

- Manipulation: Profile automatically published vs. profile published with 50% probability (less control)

- Condition 1

"The information you provide will appear on a profile that will be automatically created for you.
The profile will be published on a new CMU networking website, *which will only be accessible by members of the CMU community, starting at the end of this semester. The data will not be used in any other way. NO QUESTION/FIELD REQUIRES AN ANSWER."*

- Condition 2

"The information you provide will appear on a profile that will be automatically created for you.
Half of the profiles created for the participants will be randomly picked to be published on a new CMU networking website, *which will only be accessible by members of the CMU community, starting at the end of this semester. The data will not be used in any other way. NO QUESTION/FIELD REQUIRES AN ANSWER."*

Experiment 2

Table 2.

	Coeff	P-value
Treatment	-.25**	.05
Intrusive	-.64***	.00
Treat_Int	-.67***	.00
Age	-.02	.28
Male	.20	.10
	N= 132 Prob > χ^2 = .000	

RE Probit coefficients of panel regression of response rate on treatment with dummy for most intrusive questions, interaction and demographics

Experiment 3

- Design
  - Subjects: CMU students recruited on campus, March 2010
  - Completed online survey
  - Justification for the survey: study on ethical behaviors
  - Ten Yes/No questions that focused on sensitive behaviors (e.g. drug use, stealing)
    - Included demographics + privacy intrusive and non-intrusive questions
      - As rated by 49 subjects independently in a pre-study

Experiment 3

- Manipulations

    - **Condition 1 (only implicit control)**

    "All answers are voluntary. By answering a question, you agree to give the researchers permission to publish your answer."

    - **Condition 2 (high explicit control)**

    "All answers are voluntary. In order to give the researchers permission to publish your answer to a question, you will be asked to check the corresponding box in the following page."

    - **Condition 3 (medium control)**

    "All answers are voluntary. In order to give the researchers permission to publish your answers to the questions, you will be asked to check a box in the following page."

    - **Condition 4 (same as Condition 2, but the default is that answers will be published)**

    "All answers are voluntary. In order to prevent the researchers from publishing your answer to a question, you will be asked to check the corresponding box in the following page."

    - **Condition 5 (some control + extra demographics)**

    "All answers are voluntary. In order to give the researchers permission to publish your answers to the questions, you will be asked to check a box in the following page. Please notice that the answers to the demographic questions that you provided in the previous page will NOT be published without your explicit agreement: you will be asked permission to publish those answers separately."

Study on Ethical Behavior

IMPORTANT: All answers are voluntary. By answering a question, you agree to give the researchers permission to publish your answer.

	Yes	No
1. Are you married?	○	○
2. Have you ever been fired by your employer?	○	○
3. Have you ever stolen anything (e.g.: from a shop, a person)?	○	○
4. Have you ever used drugs of any kind (e.g.: weed, heroin, crack)?	○	○
5. Have you ever lied about your age?	○	○
6. Have you ever had cosmetic surgery?	○	○
7. Have you ever done any kind of voluntary service?	○	○

Results

Table 3.

	Comparing conditions:			
	1 and 2	*1 and 3*	*1 and 4*	*1 and 5*
Treatment	1.51**	1.92**	1.52**	.91**
	(.000)	(.000)	(.000)	(.000)
Intrusive	-.85**	-.85**	-.85**	-.84**
	(.000)	(.000)	(.000)	(.000)
Treat_Int	.59*	-1.21**	.44	-.08
	(.071)	(.002)	(.177)	(.741)
Age	.01	.03	.003	.05
	(.753)	(.521)	(.942)	(.158)
Male	.10	-.11	-.08	-.03
	(.653)	(.593)	(.684)	(.861)
N	69	65	68	66
Prob > χ^2	.000	.000	.000	.000

RE Probit coefficients of panel regression of response rate on treatment with dummy for most intrusive questions, interaction and demographics

* indicates significance at 10% level; ** indicates significance at 5% level

Experiment 3

- The coefficient on *Treatment* is always positive and significant: providing subjects with control over information publication increases their willingness to answer a question (results are similar if we only consider answers that subjects were willing to publish)

- The coefficient on the interaction is only significant when comparing condition 1 with condition 2

- The negative coefficient on the interaction in condition 3 may be due to the very nature of the treatment: makes publication of very sensitive information more salient, but does not allow the prohibition of the publication of specific questions

- Adding a dummy variable for the provision of an email address, which should have made subjects feel more identifiable, doesn't affect our results

Results

- Perceived less [*more*] control over publication reduces [*increases*] revelation of private information

  - Even though objective risks of revelation decrease [increase]

- This effect is stronger for more intrusive questions

  - It is not the publication of private information *per se* that disturbs people, but the fact that someone else will publish it for them

- Results call into questions OSNs' arguments of protecting privacy by providing more control to members

Implications

- People seem to care more for control over publication of private information than for control over access and use of that information
  - When someone other than themselves is responsible for the publication, or when the publication itself becomes uncertain – which reduces the probability of access/use by others – people refrain from disclosing
- Results call into questions OSNs' arguments that privacy is protected by providing more control to members
  - *Giving more control to users over information publication seems to generate higher willingness to disclose sensitive information*

Overall implications of BE privacy studies

- People's concerns for privacy (and security) depend, in part, on priming and framing
  - This does *not* necessarily mean that people don't care for privacy, or are "irrational," or make wrong decisions about privacy
- Rather, it implies that reliance on "revealed preferences" argument for privacy may lead to sub-optimal outcomes if privacy valuations are inconsistent…
  - People may make disclosure decisions that they stand to later regret
  - Risks greatly magnified in online information revelation
- Therefore, implications for policy-making & the debate on privacy regulation
  - E.g., Chicago School approach vs. privacy advocates
  - A problem of incentives

For more info

- Google: economics privacy

- Visit: http://www.heinz.cmu.edu/~acquisti/economics-privacy.htm

- Email: acquisti@andrew.cmu.edu