



Data Privacy and Temptation

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Motivation

- Growing concerns about data privacy in the digital age
 - EU's General Data Privacy Regulation (**GDPR**)
 - Demand for normative analysis of privacy regulations
- Extensive literature analyzing welfare effects of data sharing with rational consumers, as reviewed by Acquisti, Taylor & Wagman (2016), Bergemann and Morris (2019), Goldfarb & Tucker (2019)
 - A key tradeoff of data sharing: it improves matching efficiency, thus raising social welfare; but also allows firms to price discriminate consumers
 - The net effect on consumer surplus depends on market setting
- What if consumers cannot always act on their best behalves?

A compulsive gambler

- He tries to recover from gambling:
 - he deleted all the casino apps from his smart phone;
 - he removed his profile from all of the major gambling sites;
 - he set up a rule in Gmail to automatically delete any emails that are related to gambling.
- One day, he logged on to YouTube: "99% of the ads I see on YouTube are for gambling."

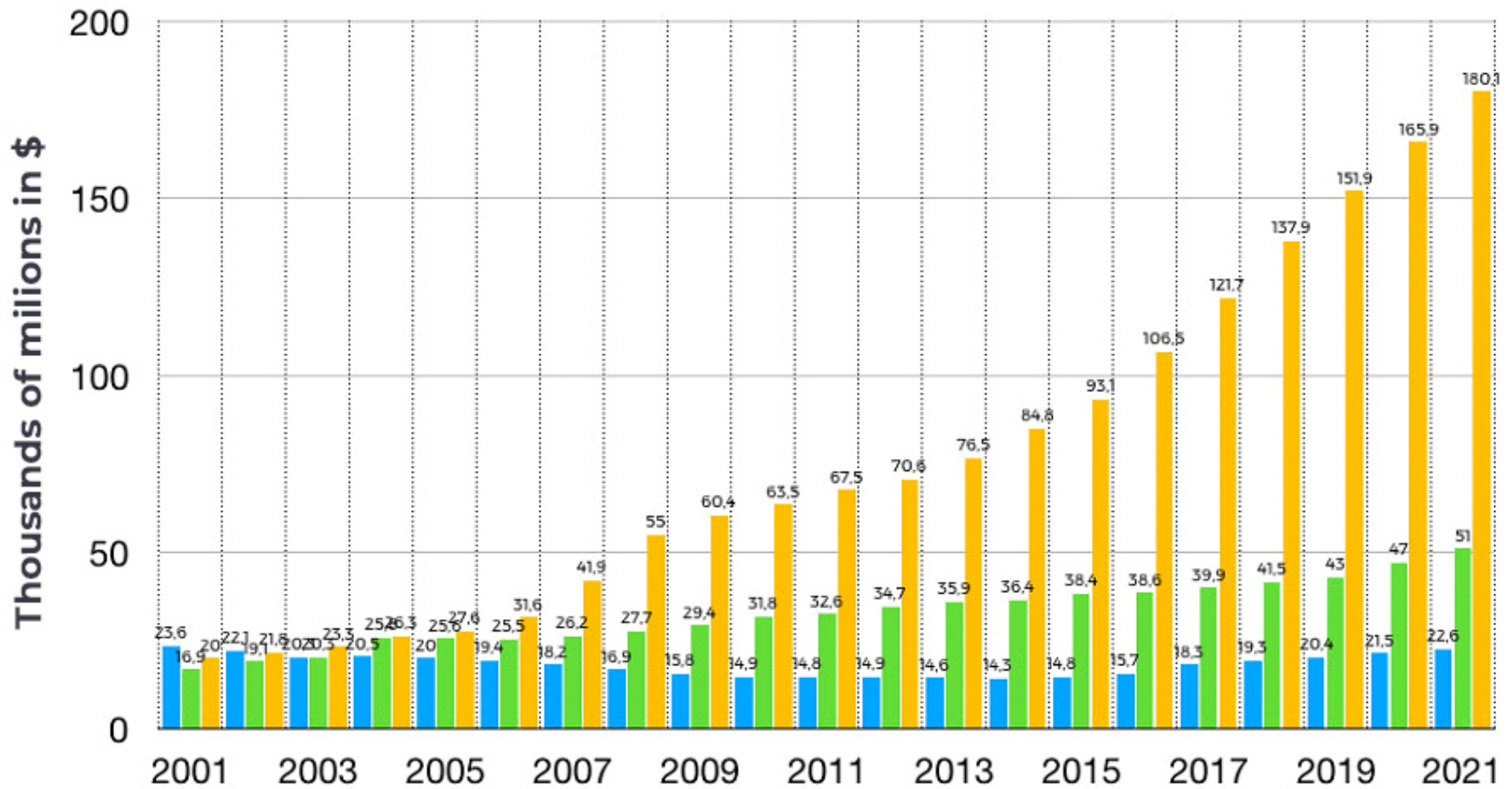
Consumer temptation

- Temptation is a problem of bounded self-control
 - Gambling
 - Video game
 - In 2018, the World Health Organization (WHO) for the first time recognized “gaming disorder”. The great majority of gamers would not experience anything close to addiction, but some gamers do struggle with addiction
 - Aguiar et al. (2018): gaming reduced labor supply of young men (ages 21-30) in U.S. by 1.5 to 3.1% since 2004
 - E-cigarette, online alcohol, adult film...
 - Payday loans
- These industries have all been using big data to target potential players, especially potential addicts

■ Music

■ Films

■ Videogames



Sources

- <http://www.ifpi.org/downloads/CMR2017.pdf>
- <https://whatsthebigdata.com/2017/06/07/bipping-point-music-streaming-becomes-primary-form-of-recorded-music-sales/>
- <https://www.statista.com/topics/964/film/>
- <https://dwmw.wordpress.com/tag/film-industry/>
- https://www.mpa.org/wp-content/uploads/2017/03/MPAA-Theatrical-Market-Statistics-2016_Final.pdf
- <https://arstechnica.com/gaming/2008/06/gaming-expected-to-be-a-68-billion-business-by-2012/>
- <https://newzoo.com/insights/articles/global-games-market-reaches-137-9-billion-in-2018-mobile-games-take-half/>



Temptation and data sharing

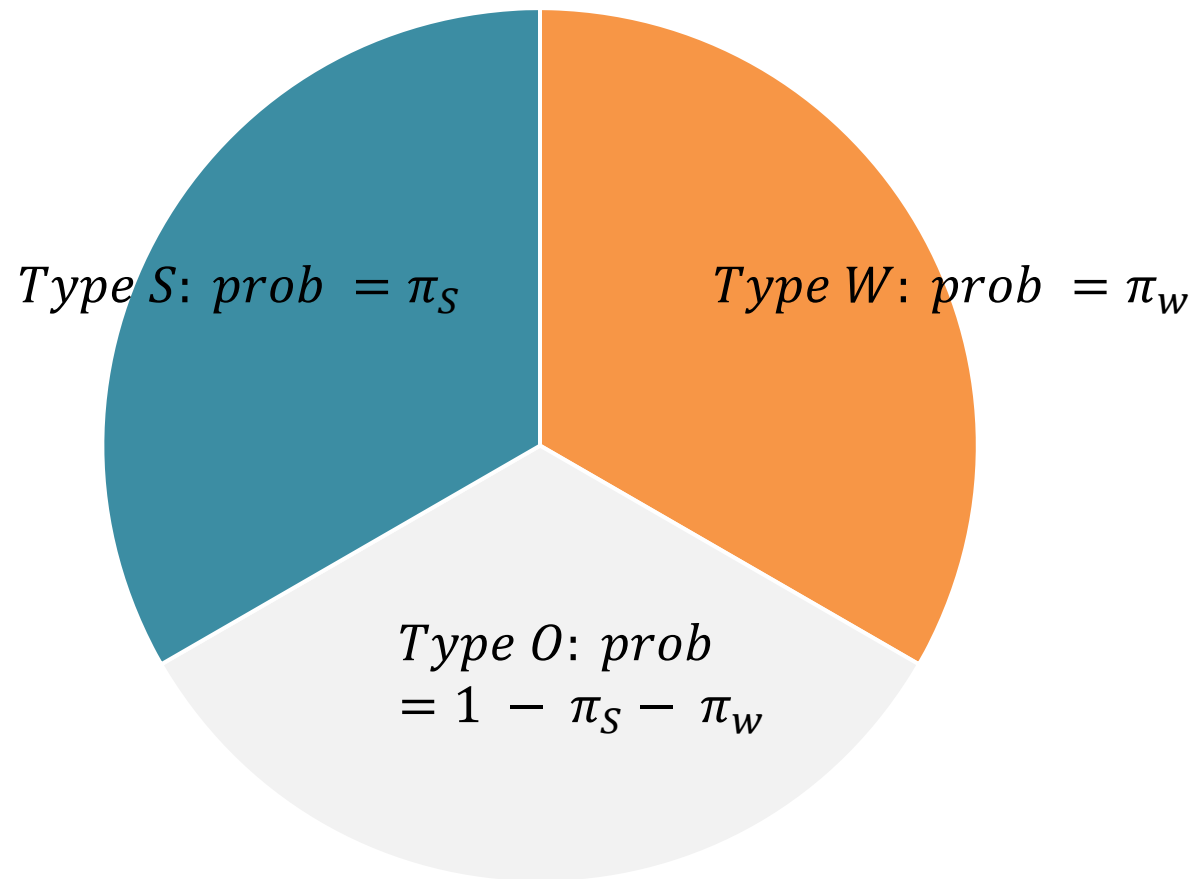
- Data sharing may expose tempted consumers to temptation goods, inducing a net social loss
 - Different from price discrimination, a distributional effect
- Competition does not cure the temptation problem, even though it helps to mitigate price discrimination
 - Competition drives firms to exploit consumer temptation by making their products and ads even more tempting
- Reminders and disclosures do not reduce temptation, even though they help to mitigate other biases such as limited attention and consumer neglect
- Consumer temptation motivates policy interventions on privacy protection
 - Can allowing consumers to opt in & out of digital tracking protect them?

The Model

- A model to evaluate how privacy may affect consumer surplus and social surplus when some consumers are subject to temptation
- An ecosystem around a digital platform, with two consumption goods sellers
 - Good A: a normal good like music
 - Good B: a temptation good like gambling & video game
- A continuum of potential consumers in three types
 - Type S: **strong willed**, also reject good B
 - Type W: **weak willed**, may cave in to good B
 - Type O: won't buy either A or B

Distribution of consumers

SETUP:
Types of Consumers



■ Type W (weak willed) ■ Type O ■ Type S (strong willed)

Consumer preferences

- Temptation utility framework of Gul & Pesendorfer (2001, 2004)

$$\max_{x \in N} [u(x) + v(x) - p(x)] - \max_{x' \in N} v(x')$$

- $u(x)$ normal utility, $v(x)$ temptation utility
- $\max_{x' \in N} v(x') - v(x)$ cost of self control

- Good A induces only normal utility to consumer i (either strong-willed or weak-willed):

$$u(A) = \tilde{u}_A, \quad \tilde{u}_A \in [0, \bar{u}]$$

- A consumer (with the choice) buys good A if $\tilde{u}_A \geq p_A$
- Random utility prevents price discrimination by seller A

- Good B gives a normal utility of $u_B < 0$ (to all consumers) and temptation utility to consumer i (only weak-willed):

$$v(B) = \gamma_i \bar{v} - u_B, \quad \gamma_i \in [0, 1]$$

- Weak-willed will buy if $\gamma_i \bar{v} > p_B$, leading to a utility of $u_B - p_B$;
- will reject it if $\gamma_i \bar{v} < p_B$, at a self-control cost of $u_B - \gamma_i \bar{v}$

- Having good B on the menu induces an ex ante cost to weak-willed

Goods sellers

SETUP:

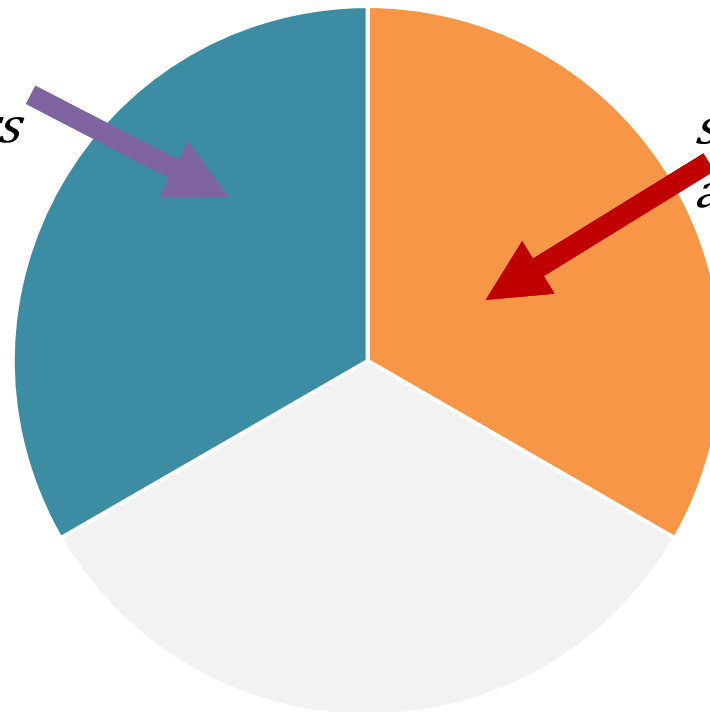
Normal and temptation goods sellers

Seller A
*sends AD to z_A consumers
at a price of p_A , costing*

$$F \frac{z_A}{1 - z_A}$$

Seller B
*sends AD to z_B consumers
at a price of p_B , costing*

$$F \frac{z_B}{1 - z_B}$$



■ Type W (weak willed) ■ Type O ■ Type S (strong willed)

Equilibrium without data sharing

BASELINE

Seller A

$$z_A = 1 - 2 \sqrt{\frac{1}{\pi_S + \pi_W} \frac{F}{\bar{u}}}$$

$$p_A = \frac{1}{2} \bar{u}$$

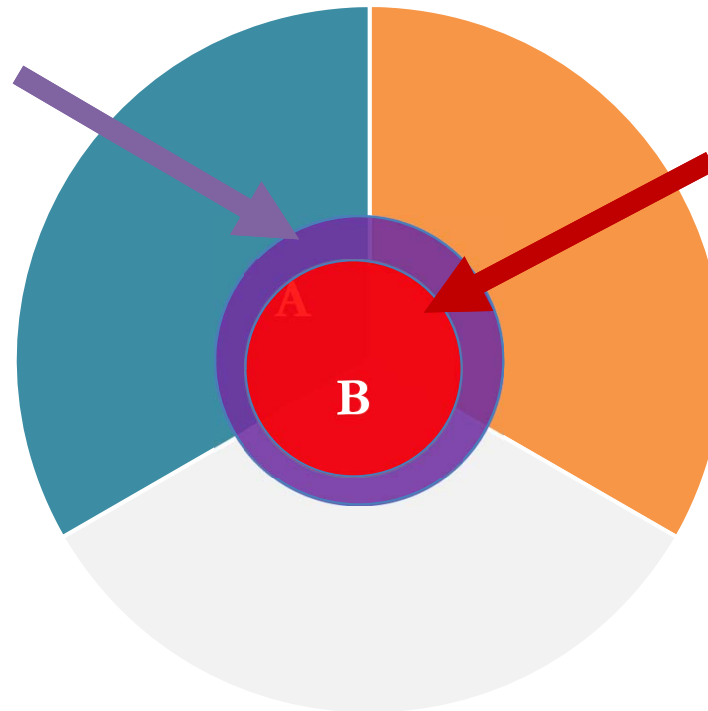
Effective AD: $(\pi_S + \pi_W) z_A$
 Half accepted by $\alpha_i > \frac{1}{2}$

Seller B

$$z_B = 1 - 2 \sqrt{\frac{1}{\pi_W} \frac{F}{\bar{v}}}$$

$$p_B = \frac{1}{2} \bar{v}$$

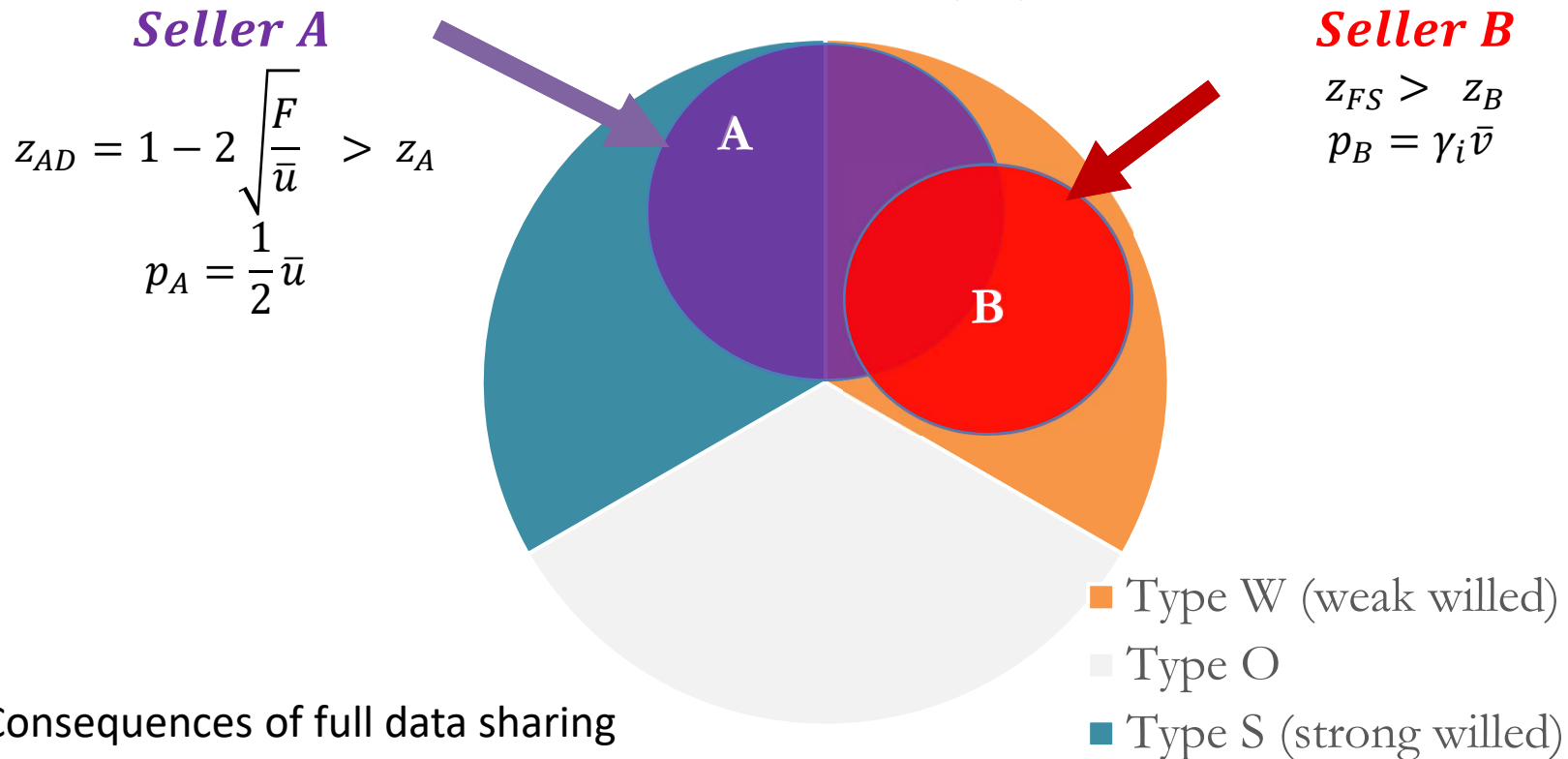
Effective AD: $\pi_W z_B$
 Half accepted by $\gamma_i > \frac{1}{2}$



- Type W (weak willed)
- Type O
- Type S (strong willed)

Equilibrium with full data sharing

FULL DATA SHARING:
Sellers know W, S, O



- Consequences of full data sharing
 - Improves the profits of both sellers
 - Improves the welfare of strong-willed consumers
 - Reduces the welfare of weak-willed if the temptation problem is sufficiently severe, i.e., u_B is sufficiently low and \bar{v} sufficiently high
 - Reduces social welfare if the temptation problem is sufficiently severe

Equilibrium with opt-in & opt-out

PRIVACY:

Opt-in and opt-out

Seller B

$$z_{B,in}, p_{B,in} = \gamma_i \bar{v}$$

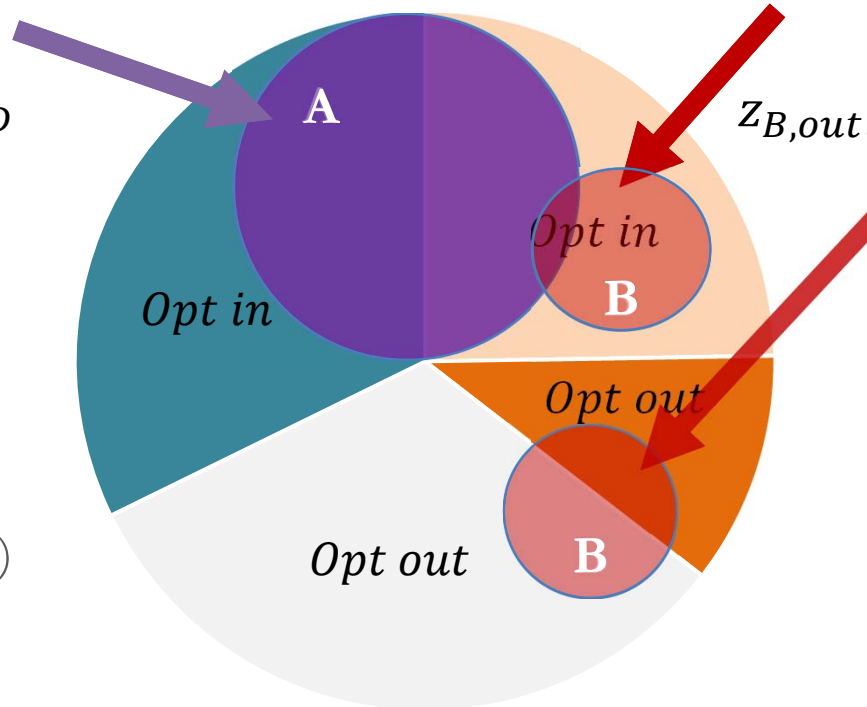
$$z_{B,out}, p_{B,out} = \max\left\{\frac{1}{2}, \gamma_{**}\right\} \bar{v}$$

Seller A

$$z_{A,in} = 1 - 2\sqrt{\frac{F}{\bar{u}}} = z_{AD}$$

$$p_A = \frac{1}{2} \bar{u}$$

- Type W (opt out)
- Type W (opt in)
- Type O
- Type S (strong willed)



Effectiveness of opt-in policy

- Both sellers prefer more data sharing
 - Pecking order in profit: Full Sharing > Opt-in & Opt-out > No Sharing

Does the opt-out option protect weak-willed?

- If the temptation problem is sufficiently severe, i.e., u_B is sufficiently low and \bar{v} sufficiently high, the welfare of weak-willed decreases with data sharing
 - Full Sharing < Opt-in & Opt-out < No Sharing
 - The opt-in policy cannot recover the no-data-sharing benchmark
- If the temptation problem is even more severe, the social surplus also has the same pecking order

Key externality:

- Opt-in by strong-willed reduces the camouflage of weak-willed in the opt-out pool
 - The social nature of data sharing, e.g., Bergemann et al (2019) and Acemoglu et al (2019)

Implications

- The opt-in policy may not protect weak-willed consumers from temptation goods sellers
 - motivated by gains from opting in, strong-willed and modestly weak-willed reduce the camouflage of severely weak-willed in the opt-out pool
- Privacy paradox
 - Bundling of data sharing with normal and temptation goods sellers
 - Small incentives may induce other consumers to abandon weak-willed
 - Need to unbundle data sharing

Summary

- A model of privacy preferences through temptation utility
 - Consumers' preferences of keeping temptation goods off their menus determine their preferences for data sharing
- A simple tradeoff of data sharing
 - Improves the matching between normal good sellers and consumers
 - Exposes weak-willed consumers to temptation good sellers
- The opt-in policy may not sufficiently protect weak-willed consumers due to the opt-in externality