

*Discussion of Dynamic Privacy
Choices*

Michael Sockin
UT Austin McCombs School of Business

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Motivation

- ▶ Proliferation of online platforms that collect (and sell) user data
 - ▶ Alibaba, Amazon, Facebook, Google, Apple, UBER,...
- ▶ Such platforms are ubiquitous in our everyday lives
 - ▶ **benefits:** myriad conveniences (free email, search, texting, directed shopping, p2p transactions,...)
 - ▶ **costs:** the more active we are, the more platforms learn about us → better targeting but also "echo chambers", "silo-ing", (non-)price discrimination, surveillance, ...
- ▶ Nascent privacy regulation
 - ▶ GDPR (Right to be Forgotten), CCPA
 - ▶ additional possibilities: limitations on data collection and retention, promoting of platform competition

This Paper

- ▶ How do platform privacy policies impact consumer welfare when participation is entangled with data collection?
 - ▶ with discretion and (short-run) commitment
- ▶ How does competition and privacy regulation impact consumer and platform behavior?

Review of Model

A Dynamic Model of Consumer Privacy Choice

- ▶ Consumer with hidden type X chooses activity level a_t on platform
 - ▶ platform initial belief $X \sim \mathcal{N}(0, \sigma_0^2)$
- ▶ Participation creates a signal s_t about X for platform

$$s_t = X + \epsilon_t + z_t,$$

where $\epsilon_t \sim \mathcal{N}\left(0, \frac{1}{a_t}\right)$ (sender) and $z_t \sim \mathcal{N}(0, \gamma_t)$ (receiver) noise

- ▶ platform posterior belief $X|\mathcal{F}_t \sim \mathcal{N}(\hat{X}_t, \sigma_t^2)$
- ▶ Consumer derives flow utility $u(a_t) - v(\sigma_t^2 - \sigma_0^2)$
- ▶ Platform derives flow profit $\sigma_t^2 - \sigma_0^2$
 - ▶ chooses privacy policy γ_t each period

Key Insights

- ▶ Consumer marginal cost of privacy falls over time
 - ▶ if participate at $t = 0 \rightarrow$ **privacy lost in long-run**
 - ▶ privacy level falls over time and learning occurs quickly (Bayesian parameter uncertainty)
 - ▶ **anti-competitive:** incumbent entrenched because marginal privacy cost of participation lower than for entrant
 - ▶ distinct from product entrenchment from consumer tracking (e.g. Campbell, Goldfarb, and Tucker (2015), Board and Lu (2015))
- ▶ Privacy regulation may have unintended consequences
 - ▶ protection $\uparrow \rightarrow$ participation $\uparrow \rightarrow$ \uparrow loss of privacy in long-run (even with forward-looking consumer)
 - ▶ erasure of data a band-aid for problem \rightarrow platform adapts
- ▶ Privacy regulation should take a **long-term** view!

Comments

Time-consistency

- ▶ Preferences over variances typically not time-consistent

$$\Pi_t = \sup_{\gamma_t} \sigma_0^2 - \sigma_t^2(\mathbf{a}_t, \gamma_t) + E[\Pi_{t+1} | \mathcal{F}_t],$$

where $\sigma_t^2(\mathbf{a}_t, \gamma_t) = \text{Var}[X | \mathcal{F}_t]$

- ▶ technically issue is Law of Total Variance:

$$E[\text{Var}[X | \mathcal{F}_t] | \mathcal{F}_{t-1}] = \text{Var}[X | \mathcal{F}_{t-1}] - \text{Var}[E[X | \mathcal{F}_t] | \mathcal{F}_{t-1}]$$

- ▶ **Classic example:** Portfolio choice with mean-variance preferences
 - ▶ time-consistent M-V preferences: Basak and Chabakauri (2009)
- ▶ **Implication:** (decision-theoretic) dominated plans and potential preference reversals
 - ▶ forward-looking consumer
 - ▶ monopolist without "long-term" commitment power
- ▶ **Suggestion:** focus on constant γ policies or solve by backward induction from some finite horizon T

The Long-Run

- ▶ In long-run, consumers lose all privacy and converge to their optimal level of usage in absence of privacy concerns
 - ▶ decreasing marginal cost of privacy loss
 - ▶ parameter uncertainty for consumer type
- ▶ Not clear welfare is only about the long-run for policy
 - ▶ transition path matters
- ▶ **Classic example:** Optimal labor taxation with complete markets (Lucas and Stokey (1982)) and risk-free bond with QL preferences (Aiyagari, Marcet, Sargent, and Seppala (2002))
 - ▶ **complete markets:** constant proportional labor tax in long-run
 - ▶ **risk-free bond:** first-best in long-run
 - ▶ but only a risk-free bond cannot be better than complete markets!
- ▶ **Implication:** policies that increase platform participation (stricter data collection or retention) may still provide higher lifetime utility

Social Welfare

- ▶ Focus is on consumer welfare
 - ▶ ...but platform also earns profits
- ▶ Suppose platform ultimately owned by consumers, social surplus is:

$$W = U + \Pi = \sum_{t=0}^{\infty} \beta^t [u(a_t) + (1 - \nu) (\sigma_0^2 - \sigma_t^2)]$$

- ▶ **Interpretation:** Consumers paid for their data that firms monetize
 - ▶ ...question is then whether consumers are paid enough

Social Welfare

- ▶ Without modeling benefits of data sharing, can also interpret model as a repeated game
 - ▶ consumer chooses a_t to minimize information sharing s.t. convex cost of garbling $-u(a_t)$
- ▶ In model, no benefit to data sharing \rightarrow it is an externality
- ▶ In practice, data sharing also improves service quality
 - ▶ downside to privacy
 - ▶ otherwise best policy for consumer is **opt-in / opt-out**
- ▶ **Suggestion:** Consumer type is pair $\{X, Y\}$ where X and Y correlated
 - ▶ Platform benefit $u(a_t, \hat{Y}; Y)$ decreasing in $\sigma_{Y,t}^2$
 - ▶ Learning about Y , however, also reveals X (which hurts consumers)
 - ▶ Example: choice of media related to political affiliation

Cost of Privacy

- ▶ Marginal cost of privacy declines over time on a platform
 - ▶ more platform knows → less it can learn
- ▶ **Aside:** If consumer's type X changes over time, privacy can have a non-degenerate "steady-state" in long-run (Kalman Filter)
 - ▶ Example: hobbies / political views change over time
- ▶ Information is a **public** and **non-rival** good
 - ▶ is privacy specific to a platform? Once lost can it be regained...
 - ▶ or does participation on any platform diminish privacy?
(Data-Enriched profiles, data sales to third parties)
- ▶ Is the loss of privacy over time inevitable?
 - ▶ if user data not platform-specific → free-rider problem since early platforms bear higher cost of privacy
 - ▶ should privacy regulation be more holistic?