

In Privacy We Trust: The Effect of Privacy Regulations on Data Sharing Behavior

Ozge Demirci¹ Ayelet Israeli² Eva Ascarza²

¹Imperial College London

²Harvard Business School

Motivation: Data Utility vs Privacy Concerns

- ▶ Consumer data is essential for the digital economy
 - ▶ Firms use it to improve targeting, recommendations, and pricing
 - ▶ Consumers benefit from personalized recommendations, offers, and convenience
- ▶ Growing concerns about data privacy
 - ▶ Who controls the data and how is it used?
 - ▶ How much control do consumers have?
- ▶ **Policy response:** Stronger privacy regulations aim to protect personal data by giving consumers greater control over how it is collected and used
- ▶ **How do stronger privacy protections affect consumers' willingness to share data?**

Two predictions in the literature

How do stronger privacy protections affect willingness to share data?

More cautious (less sharing)

Transparency



Greater awareness of data practices



Heightened privacy concerns



Opt-out and reduced sharing

E.g., Goldfarb and Tucker (2011);
Acquisti et al. (2016); Aridor et al.
(2023)

More trusting (more sharing)

Rights and protections



Institutional legitimacy



Greater trust in firms



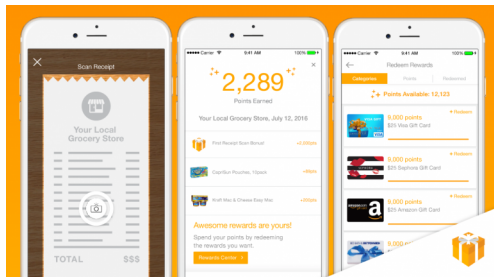
**Greater willingness to share
data**

E.g., Tucker (2014); Gupta et al.
(2023)

Two privacy law changes in January 2023

- ▶ **Policy change** – California Privacy Rights Act (CPRA) and Virginia Consumer Data Protection Act (VCDPA)
 - ▶ **More consumer control:** access, correct, delete, and opt out of sale or sharing
 - ▶ **Limits on sensitive data collection and use** (e.g., health, financial, precise location)
 - ▶ **Stronger obligations for firms:** data minimization and consent requirements
- ▶ **Treatment in our setting** – Consumers in CA and VA are exposed to the regulatory change through:
 - ▶ publicity about the new privacy laws
 - ▶ updated terms and privacy policies
 - ▶ new privacy choice pages and consent interfaces

Empirical Context: Customer Engagement Platform



- ▶ A mobile app that rewards users for scanning and uploading receipts
 - ▶ Users voluntarily share purchase data in exchange for rewards
- ▶ The app provides personalized offers based on purchase history
- ▶ Points can be redeemed for gift cards

This paper

- ▶ The impact of privacy laws in **California** and **Virginia** on data-sharing behavior
 - ▶ Effects on both the **amount** and **type** of information shared
 - ▶ Synthetic difference-in-differences using variation across U.S. states
- ▶ Detailed **platform data** to measure changes in sharing of consumption data by users
- ▶ Provides **supporting evidence** from the Consumer Expenditure (CE) Survey metadata to test whether policy effects extend beyond the platform
- ▶ Explores mechanisms behind the changes:
 - ▶ Changes in interest in privacy (Google Search data)
 - ▶ Changes in stated privacy concerns during surveys (CE Survey)

- ▶ **Main dataset: Customer engagement platform**
 - ▶ Receipt-level data from a mobile app where users upload purchase receipts between October 2022 and March 2023
 - ▶ New users who joined in October 2022
 - ▶ Key behaviors and variables:
 - ▶ Receipt uploads: items purchased, spending, retailer information, purchase and scan dates
 - ▶ In-app incentives (points, offers)
- ▶ **Supporting evidence: Consumer Expenditure Survey metadata**
 - ▶ Survey interaction metadata from a nationally representative sample between 2019 and 2024
 - ▶ Share of expenditure-related questions answered
 - ▶ Whether privacy concerns were raised during the interview

Empirical Analysis: Identification

▶ Synthetic Difference-in-Differences (SDID):

- ▶ Compare changes in sharing behavior in CA and VA to those in other states before and after the law change
- ▶ Combines DiD with synthetic control reweighting to match pre-treatment trends

$$(\hat{\tau}, \hat{\mu}, \hat{\alpha}, \hat{\beta}) =_{\tau, \mu, \alpha, \beta} \sum_{i=1}^N \sum_{t=1}^T (y_{it} - \mu - \alpha_i - \beta_t - \tau W_{it})^2 \hat{\omega}_i \hat{\lambda}_t$$

- ▶ y_{it} : Log number of receipts uploaded by user i in week t
- ▶ α_i, β_t : Individual and week fixed effects
- ▶ $\hat{\omega}_i, \hat{\lambda}_t$: Unit and time weights estimated to balance pre-treatment outcomes

▶ Event study graph

Privacy laws increased data sharing by $\sim 9\%$

DV: log(receipts)	(1) Full sample	(2) Below Median	(3) Above Median
Post \times Treat	0.088*** (0.002)	0.066*** (0.019)	0.006*** (0.002)
Observations	316,806	156,366	160,440
Pre-treatment Mean	4.13	0.84	7.48
Week FE	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes

- ▶ Privacy laws increased receipt uploads by $\sim 9\%$ in treated states
- ▶ The increase is more pronounced among less active users at baseline
- ▶ Results are robust to alternative estimators such as doubly robust DiD and to raw count outcomes

▶ Robustness: Alternative methods

Users shared data from a larger variety of stores

DV:	(1) Unique stores	(2) Unique ZIP codes	(3) Retailer Category
Post \times Treat	0.052*** (0.008)	0.035*** (0.019)	0.039*** (0.004)
Observations	316,806	316,806	316,806
Pre-treatment Mean	2.45	1.58	1.22
Week FEs	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes

- ▶ Consumers shared data from a wider variety of stores
- ▶ These results suggest not only more sharing but also a broader range of information disclosed

▶ Digital Receipts

Additional Evidence and Validity Checks

1. Ruling out changes in consumption patterns

- ▶ Using Consumer Expenditure Survey consumption data
 - ▶ Test whether consumption patterns changed in treated states
- We find **no significant changes in consumption**
- ▶ Results for consumption analysis

2. Ruling out platform-side confounds

- ▶ Did platform incentives change following the privacy regulation?
 - ▶ We analyze platform offer data to test whether incentives changed for users in treated states
- We find **no significant changes in platform incentives**
- ▶ Estimation ▶ Results for platform incentives

3. Spillovers to privacy attitudes

- ▶ Using CE Survey interaction metadata
- ▶ Records respondent–interviewer interactions: answered, skipped, refusal
- ▶ Test whether privacy regulations affect disclosure behavior

Results: Willingness to Share in CE Survey

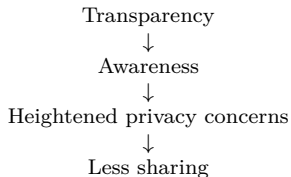
- ▶ We measure the share of expenditure questions answered in the Consumer Expenditure Survey and estimate changes in this share

	(1) Full Sample	(2) Below Median	(3) Above Median
Post \times Treat	0.014*** (0.003)	0.033*** (0.008)	0.003 (0.002)
Observations	69,646	25,686	43,960
Household FE	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes

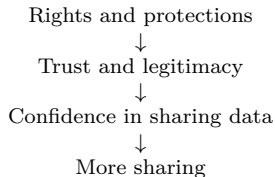
- ▶ The share of questions answered increases after privacy regulations
- ▶ The increase is driven by those who were previously more reluctant to share information
- ▶ This suggests a broader change in attitudes

Mechanisms: Why does data sharing increase after privacy regulations?

More cautious (less sharing)



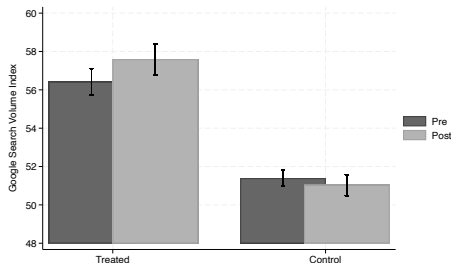
More trusting (more sharing)



1. **Did privacy regulations increase public attention to privacy?**
Measured using Google Trends search activity for privacy-related keywords
2. **Did they increase trust rather than privacy concerns?**
Measured using stated privacy concerns in CE Survey metadata

We find an increase in “privacy” search volume

Did privacy searches increase in treated states around the policy time?



	(1)
Post × Treat	1.37*** (0.20)
Observations	1,820
Month, Year, State FEs	Yes

- ▶ Around policy time, treated states saw larger increases than control states
- ▶ This suggests heightened public attention to privacy in treated states

▶ Estimation Details

We find fewer privacy concerns in the CE Survey after the regulation change

Did respondents express fewer privacy concerns after the policy?

DV: Stated privacy concerns	(1) Full Sample	(2) Below Median	(3) Above Median
Treated * Post	-0.050*** (0.013)	-0.081*** (0.024)	-0.033** (0.014)
Observations	69,646	25,686	43,960
Household FE	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes

- ▶ Respondents are less likely to report privacy-related concerns
- ▶ Largest decline among respondents who were previously less willing to share

▶ Event study

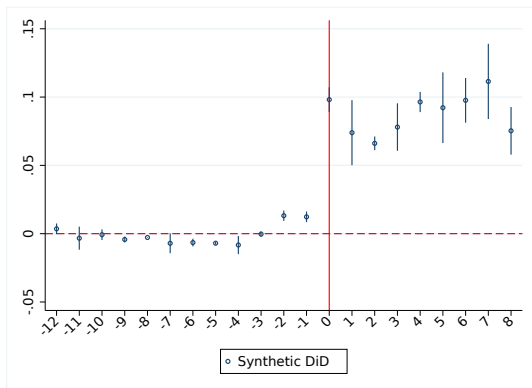
Concluding Remarks

- ▶ **Stronger privacy regulations increase data sharing**
 - ▶ Users share more data and disclose new types of information, especially among those who were least engaged before
- ▶ **Not explained by incentives or consumption**
 - ▶ No evidence of changes in platform rewards or consumption patterns
- ▶ Operates through **increased awareness and reduced concerns**
- ▶ **Economic significance**
 - ▶ Back-of-the-envelope analysis to quantify how much people value their privacy
 - ▶ Suggests privacy protections can be as effective as financial rewards in encouraging data sharing, cost-effectively
- ▶ **What does this mean?** Privacy regulations can shift perceptions of data safety, thereby encouraging greater sharing

Thank You!

o.demirci@imperial.ac.uk

Event Study: SDID for Receipt Uploads



- ▶ Each dot shows the treated-control gap in the log number of receipts that week, adjusted by the average pre-treatment gap
- ▶ Flat pre-trends support the identification strategy; post-policy weeks show a sustained increase in treated states

Results: The impact of privacy laws on receipt uploads

	(1)	(2)	(3)
	(Synthetic DID, logged)	(DR DID)	(Synthetic DID, raw)
Treated * Post	0.088*** (0.002)	0.052*** (0.010)	0.591*** (0.012)
Observations	316,806	316,806	316,806
Pre-treatment Mean	4.13	4.13	4.13
Week FE	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes

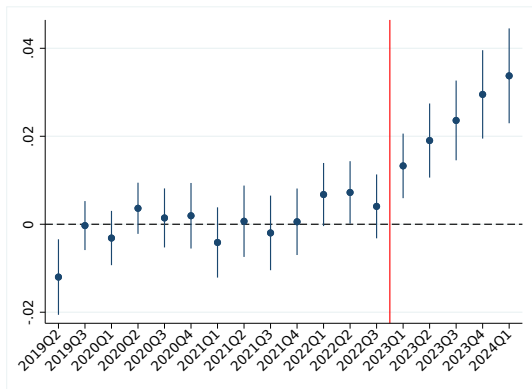
- ▶ We estimate the policy's impact using three approaches: Synthetic DiD (log outcome), Doubly Robust DiD, and Synthetic DiD with raw count outcome
- ▶ All models show a statistically significant increase in receipt uploads following the policy

Empirical Results: Digital Receipts

DV:	(1) Digital receipts uploaded	(2) Digital account linked
Post \times Treat	0.027*** (0.001)	0.002*** (0.000)
Observations	316,806	316,806
Pre-treatment Mean	0.66	0.03
Week FE	Yes	Yes
Individual FE	Yes	Yes

- ▶ Digital receipts = automatic data sharing once accounts are linked
- ▶ After the policy:
 - ▶ About a 3% increase in digital receipts uploaded
 - ▶ Small rise in likelihood of linking an account
- ▶ These results imply a greater willingness to enable passive, ongoing sharing, consistent with higher trust

Event Study: Willingness to Share in CE Survey



$$y_{st} = \sum_{w=-12}^{-1} \beta_w \text{Pre}_w \times T_s + \sum_{w=0}^8 \beta_w \text{Post}_w \times T_s + \phi_s + \theta_t + \epsilon_{st}$$

Empirical Analysis: Willingness to Share in CE Survey

- ▶ Empirical strategy: Difference-in-Differences

$$y_{it} = \gamma(\text{Treated} \times \text{Post})_{it} + \beta X_{it} + \phi_i + \theta_t + \epsilon_{it}$$

- ▶ y_{it} : Share of expenditure questions answered by household i in quarter t
- ▶ Treated \times Post: Indicator for CA & VA after Jan 2023
- ▶ Fixed effects: Household (ϕ_i) and Quarter (θ_t)
- ▶ Repeated cross-sectional data: households observed within a single year

Empirical Analysis: Platform Strategy

Question: Did the observed increase in data sharing reflect changes in consumer behavior or platform adjustments to incentives?

- ▶ Data: Offer data at the state–offer–week level
 - ▶ Over 80% of offers are distributed nationally
 - ▶ Focus on variation in exposure and intensity across states
- ▶ Measures: Number of users receiving each offer, users per offer and points per offer
- ▶ Estimation: Difference-in-differences and synthetic DiD by using the variation across states

Empirical Analysis: Platform Incentives for Sharing Data

	(1)	(2)	(3)
	Nb of users with offer	User per offer	Points per offer
Post \times Treat	19,900 (13,689)	14,350 (9,843)	15.92 (9.81)
Observations	1,113	1,113	1,113
Pre-treatment Mean	64,385	68,856	2,209
Week FE	Yes	Yes	Yes
State FE	Yes	Yes	Yes

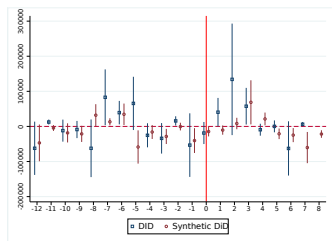
- ▶ No statistically significant shifts in offer exposure or intensity
- ▶ Increased data sharing cannot be explained by changes in platform incentives
- ▶ Replicated the analysis using SDID and find consistent null results

▶ Event Study Analysis

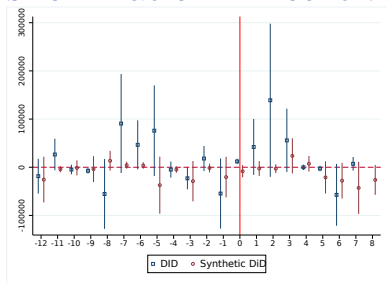
▶ SDID Results

▶ Back

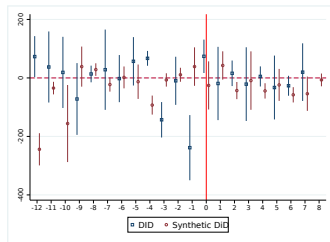
Results: Event Study Analysis for Platform Incentives



(a) Number of users with offers



(b) Users per offer



(c) Points per offer

Results: SDID Estimates for Platform Incentives

	#Users with offer (SDID)	Users per offer (SDID)	Points per offer (SDID)
Post \times Treat	64.48 (4,421.6)	-11,188 (7,596.7)	-24.66 (18.76)
Observations	1,113	1,113	1,113
Pre-treatment Mean	64,385	68,856	2,167
Week FE	Yes	Yes	Yes
State FE	Yes	Yes	Yes

- ▶ Results consistent with DID: no evidence of significant changes in exposure or rewards
- ▶ Supports the conclusion that platform incentives did not drive increased data sharing

▶ Back

Consumer Expenditure Survey: Consumption Patterns

Did consumption contemporaneously increase in treated states around the policy?

	Total	Food	Beverage	Apparel
Post \times Treat	-1.63 (45.38)	-1.386 (38.27)	-1.227 (5.64)	0.977 (13.81)
Observations	77,645	77,645	77,645	77,645
R-squared	0.844	0.831	0.737	0.595
Quarter FE	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes

- ▶ No evidence of increased consumption in treated states
- ▶ Results suggest changes in *data-sharing behavior*, rather than actual increases in consumption

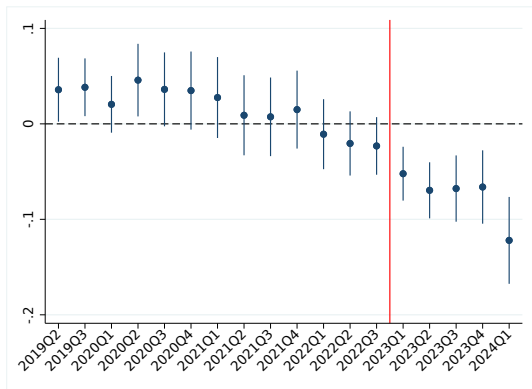
Empirical Analysis: Increase in Google Search Volume

- ▶ Empirical strategy: Difference-in-Differences

$$SVI_{st} = \beta(\text{Treated} \times \text{Post})_{st} + \gamma_s + \delta_t + \alpha_m + \varepsilon_{st}$$

- ▶ SVI_{st} : Google search volume index for “privacy” in state s at month t
- ▶ $\text{Treated} \times \text{Post}$: Indicator for CA & VA after Dec 2022 (policy period)
- ▶ Fixed effects: State (γ_s), Month (δ_t), Year (α_m)
- ▶ Identifies whether privacy-related searches rose more in treated vs. control states around policy implementation

CE Survey: Privacy concerns expressed



$$y_{st} = \sum_{w=-12}^{-1} \beta_w \text{Pre}_w \times T_s + \sum_{w=0}^8 \beta_w \text{Post}_w \times T_s + \phi_s + \theta_t + \epsilon_{st}$$

▶ Back