

Strategy & Experiments

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Why run experiments?

- The fundamental problem of causal inference is that we only observe one potential outcome per unit.
 - If I raise prices for my product, I can't also see what happens if I lower the price.



From \$53 · Nice Private Room in Nice Quiet C...

Private room · 1 bed

2 reviews

Experiment \Rightarrow Average Treatment Effect

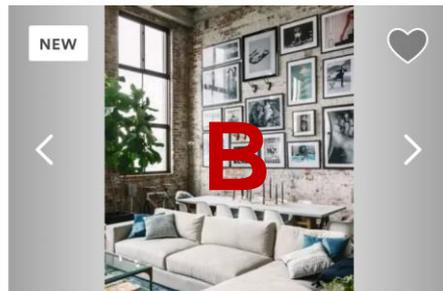
- Experiments randomize units to a treatment A and a control group B in order to estimate the **Average Treatment Effect (ATE)**: $\hat{Y}_{\text{Treatment (A)}} - \hat{Y}_{\text{Control (B)}}$
- Is my outcome in the high price group (A) better than the low price group (B)?



From \$102 · Downtown 2 Bedroom Luxury Ho...
Entire condominium · 3 beds
★★★★★ 34 · Superhost

From \$53 · Nice Private Room in Nice Quiet C...
Private room · 1 bed
2 reviews

From \$89 · The Garden Suite - A Private Gues...
Entire guest suite · 1 bed
★★★★★ 45 · Superhost



From \$85 · Industrial Loft with Panoramic Vie...
Entire loft · 2 beds



From \$80 · Entire place in Castleberry Hills
Entire apartment · 2 beds
★★★★★ 15 · Superhost



From \$40 · Mercedes Benz Stadium Suite #1
Private room · 1 bed
★★★★★ 182

Experiments drive product improvement

- Lots of experimentation by data scientists at facebook, Uber, airbnb, Microsoft and Google (e.g. Conference on Digital Experimentation)
- AB testing of UI/UX at Bing improved ad click rates rates (Kohavi et al. 2014)
- RCTs show that social information increases product virality (Aral and Walker 2011)
- Experimentation on e-commerce platforms reveals that describing products as scarce, deals as urgent, contain social proof, and provide related recommendations leads to increase adoption and revenue per visitor (Brown and Jones, 2017)

But does experimentation improve firm performance?

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- Experiments may lead to small wins (Kohavi et al. 2014; Levitt et al. 2016), but the cost of running them may be greater than the measured benefits.
- Experiments may lead to “iterative search” reducing right tail outcomes and a focus on the short term (Ewens et al. 2017)
- If the outcomes of experiments are public, competitors may be able to free ride on a firm’s costly experimentation.
- The N required may be so large that only a handful of firms can leverage experiments successfully (Lewis and Rao 2015). Perhaps only platforms?

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- *Beyond the potential payoffs, what drives firms to adopt experimental methods, frameworks and tools? Treatment and selection matter!*
- Does competition drive firms to experiment?
- How does geography shape who learns to experiment?
- What is the role of human capital? Do firms need statisticians?
- What types of firms (platforms, marketplaces, saas, ...) are most likely to use experimentation?
- What about industry regulation?

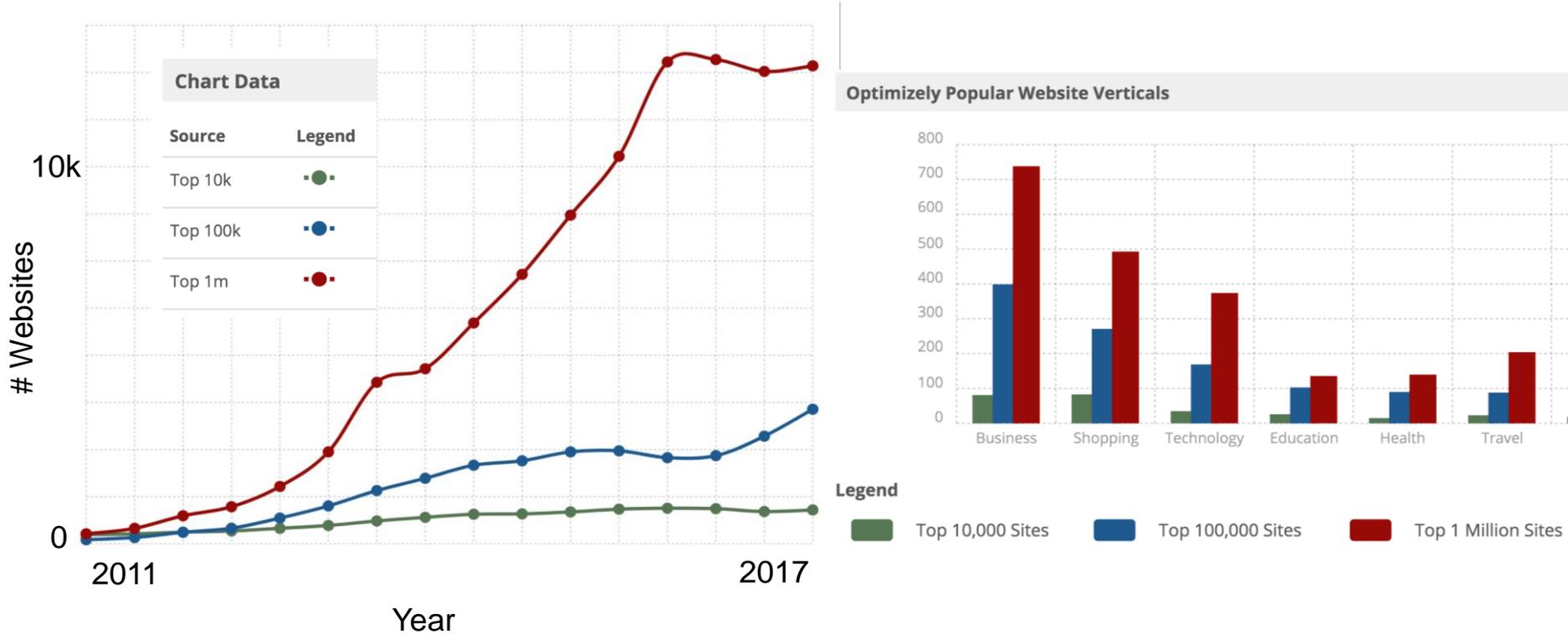
AB testing as a measure of firm experimentation



- Most firms rely on third-party tools like Optimizely, Adobe Test and Target, and Mixpanel.
- Using data from BuiltWith.com we track when firms adopt, update, upgrade, and abandon AB testing tools.
- After merging BuilWith.com and Crunchbase, we have a dataset of 135,421 firms where we can track AB testing adoption over time allowing us to see when firms adopt and potentially impact on firm outcomes.
- Also merging with SimiliarWeb.com data on weekly page views and user engagement to get more granular outcome measures.

Some early descriptives

- Huge explosion in use of AB testing tools. Differences across verticals?



- *What else do digital tools tell us about firm strategy, competition and ecosystems? Do these tools provide an opportunity for academic experimentation?*