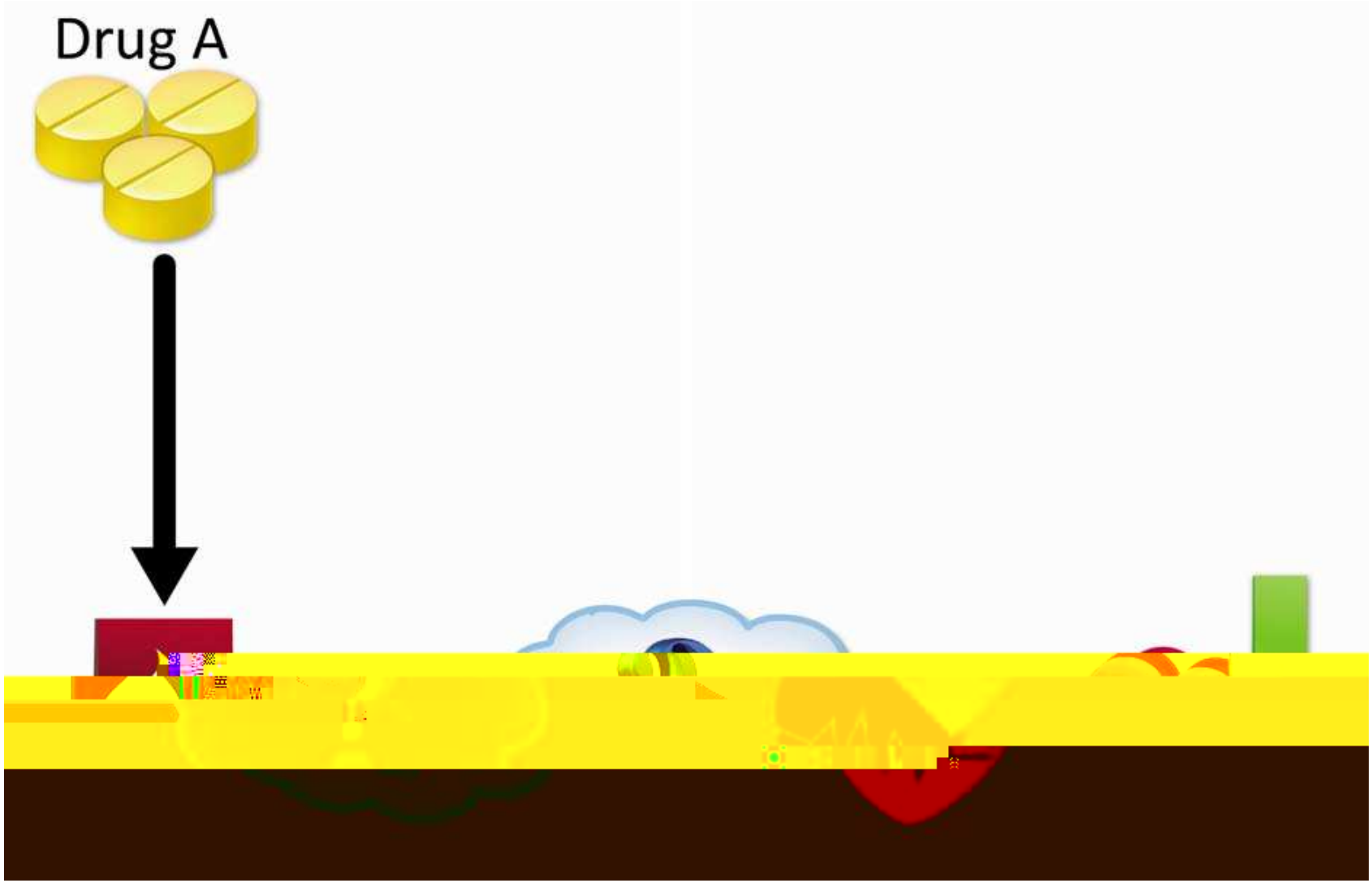
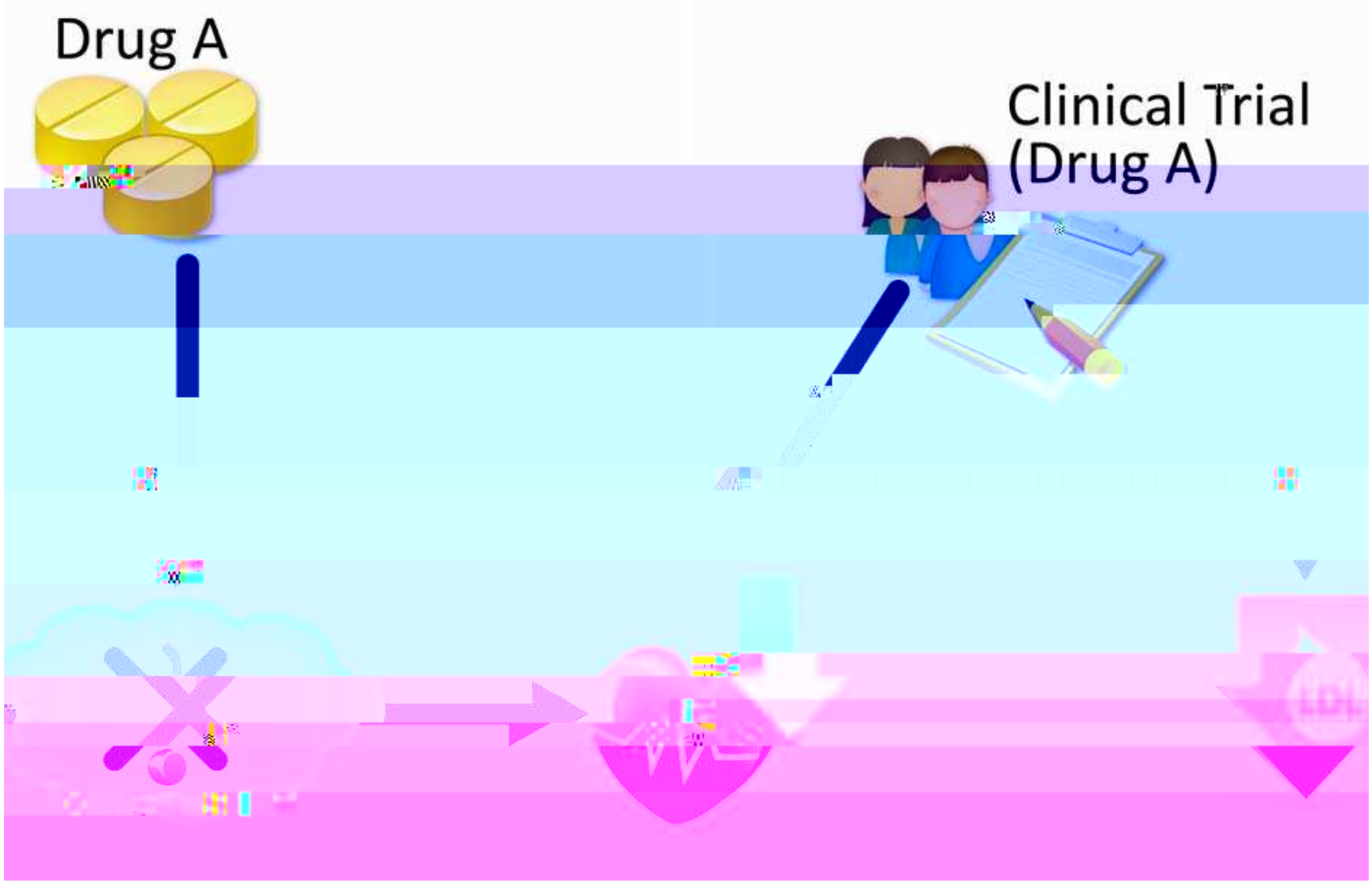
A Structural Analysis of Detailing, Pub[illegible]

Motivation


Drug A

Correlated Learning



Research Objectives

- Develop a demand model with correlated learning across brands within a category
- Quantify the extent of correlated learning using data on market shares and quality signals (landmark clinical trials)
  - Quantify the late mover advantages
- Taking the presence of switching costs into consideration by employing switching rate data

Sales and Detailing Data

- Quarterly Canadian data for each statin between Q2 1993 and Q4 2004 from IMS Canada
  - Prescription volume, Detailing
- Quarterly data on switching between Q2 1993 and Q4 2004 from Ontario Health Insurance Program (OHIP)
  - % of statin users who switch from a given statin to another statin (2.10% on average) $\rightarrow$ Switching costs exist.

Landmark Clinical Trials

- It is very difficult for physicians to learn about drugs' efficacy in heart disease risks from patient's feedback.
- Collect 12 landmark clinical trials reporting the efficacy of statins in reducing heart disease risks between 1993 and 2004.
- The number of patients consists of 2,000 to 10,000 and the follow-up period ranges from 2 to 6 years.
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Decision Process of Existing Patient

E□cacies of Statins

- q_j^c denotes the true e□cacy in lowering cholesterol levels of drug **j**
  - The e□cacy in lowering cholesterol levels is known to physicians
  - A meta-analysis provides such information
- q_j^h denotes the true e□cacy in reducing heart disease risks of drug **j**
  - The e□cacy in reducing heart disease is uncertain to physicians
  - Physicians learn about this e□cacy from landmark clinical trials

Learning about Heart Disease Risks

Let q_j^h be the true e□cacy in reducing heart diheh4.13-1..94.1-1..9(h4.13-1..9

Initial Prior Beliefs

Quality Signal

Let β_j be the true mean level of the e□ciency ratio for drug j. A noisy but unbiased observable signal from clinical trial l for drug j is

$$\tilde{\beta}_{jl} = \beta_j + \zeta_l$$

where $\zeta_l \sim N(0, \sigma_\zeta^2 / N_l)$ and N_l denotes the number of patients who participate in landmark clinical trial l.

Updating Process for Drug 2

Assume that a physician learns about clinical trial **l** for drug 1 at time **t**.

Informative Detailing and Publicity

Types of Physicians

- If there are $\mathbf{n}_t$ clinical trials up to time **t**, theoretically there will be $2^{\mathbf{n}_t}$ types of physicians at time **t**. ($\mathbf{n}_t = \sum_{j=1}^{J} \mathbf{n}_{jt}$)
- To simplify the model, I assume that if a physician learns about a clinical trial for drug **j** at time **t**, she will learn about all the published clinical trials for drug **j** prior to time **t**.
- Then, the number of physician types reduces to $(\mathbf{n}_{1t} + 1) \cdot (\mathbf{n}_{2t} + 1) \cdots (\mathbf{n}_{Jt} + 1)$ under this assumption where $\mathbf{n}_{jt}$ denotes the number of clinical trials for drug **j** up to time **t**.

Utility Function

Let patient i's utility of consuming statin j at time t be

$$U_{ijt} = \omega \cdot q_j^h + b_j + \varepsilon_{ijt},$$

where q_j^h denotes drug j's efficacy in reducing heart disease risks; b_j captures time-invariant brand specific preference.

Physician k's expected utility of prescribing drug j to patient i at time t becomes

$$E[U_{ijt}^k | I^k(t)] = \omega \cdot E[q_j^h | I^k(t)] + \kappa_d \cdot STK\_detail_{jt} + b_j + \varepsilon_{ijt},$$

where STK_detail_{jt} is a persuasive detailing goodwill stock for drug j at time t.

Identification

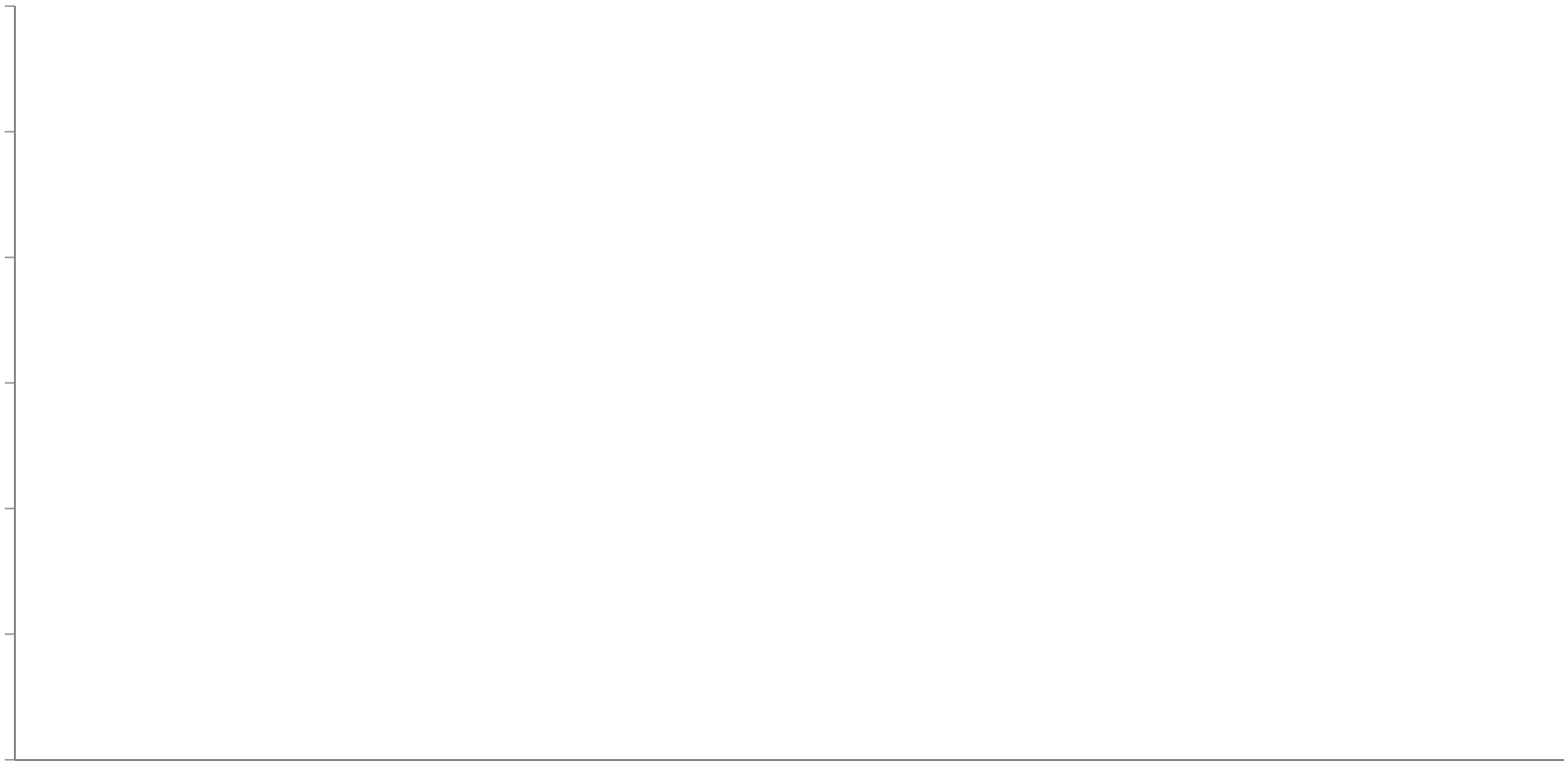
- Correlated Learning
  - Sales changes after a clinical trial is released identify correlated learning parameters.
- Informative Detailing
  - Variations in sales and detailing before and after each clinical trial release identify the informative e□ects.

Result Tables(1)

Results

- The estimate of the correlated learning parameter (ρ_0) is 0.658, which suggests a partial information spill-over.
- The estimates of both persuasive (κ_d) and informative (α_d) detailing parameters are positive and significant.
- The information carryover rate of physicians (δ_p) is 0.89 per quarter.
- Publicity in reducing heart disease risks (α_{rh}) has a significant impact on updating physicians about clinical trial information.
- Only aggregate detailing stock (α_d^s) matters in adoption stage.

Expt 2: No Correlated Learning



Expt 3: No Switching Cost