Dynamic Oligopoly Model: Elite Handbag Industry

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Fall 2025

Motivation

i. The global luxury handbag market was valued at approximately $28.64 billion in 2024 and is projected to grow at roughly 6% per year in the next decade Group, 2025.

ii. For instance, LVMH is estimated to have spent 9.8 billion Euros in ads and promotion in 2024 which was approximately 11.5% of revenue Group, 2025.

iii. Other top players in this industry are Gucci (founded in 1921), Hermes (1837), Chanel (1910) Cage, 2025.

Marketing Tactics

i. Scarcity and exclusivity: "this is a limited addition product".
ii. Storytelling and heritage: legacy rather than just product specifications.
iii. Influencers and celebrity amplification: social media campaigns for hype.
iv. Magazines for prestige, long-term brand reinforcement and credibility.

Research Gap in IO Literature

- Surprisingly little detailed research on luxury handbag industry in IO literature (KonishiWang, 2025 is a recent exception).
- Background:
  - Long tradition of economics of advertising Bagwell, 2007 in IO.
  - Recent advances: Blake, 2015; DecarolisRovigatti, 2021; Goeree, 2008; Shapiro, 2021

Research Objectives

- Quantify the structure of advertising investments in the sector: frequency of marketing, marketing types and effect of ads on prices and market power.
- Answer classical IO questions for luxury handbags:
  - Role of ads in information provision, consumer perception management, competitive behavior or complementarity in consumption (see Bagwell, 2007 for review).
- Market power evolution estimates across players over time.

Model

i. $p_{i,s,t} = f(Q_{s,t}, q_{1,s,t}, q_{2,s,t}, \tau_{s,t}, B_{1,s,t}, B_{2,s,t})$

ii. $p_{1,s,t} = \alpha_{s,t} - v_{s,t} q_{1,s,t} + \psi(m_{1,t}, \tau_{s,t}) \times (B_{1,s,t} - B_{2,s,t})$

iii. $p_{2,s,t} = \alpha_{s,t} - v_{s,t} q_{2,s,t} + (1 - \psi(m_{1,t}, \tau_{s,t}) \times (B_{2,s,t} - B_{1,s,t})$

iv. $\psi(\tau_{s,t}, m_{s,t}) = \frac{\tau_{s,t} \ln\left(1 + \frac{q_{1,s,t}}{Q_{s,t}}\right)}{\ln 2}$, $\tau_{s,t} \in [0, 1]$ is the prestige shock for brand 1.

v. $q_{1,s,t} + q_{2,s,t} \leq Q_{s,t}$ (Gucci and LVMH)

Model

i. $q_{j,s,t} \in [0,1]$, $I_{j,s,t} \in [0,1]$, $\rho \in [0, 0.3]$.

ii. $B_{1,s',t} = \sum_s \Pi(s'|s)\rho(I_{1,s,t-1})B_{1,s',t-1} + I_{1,s',t}$ and
$B_{2,s',t} = \sum_s \Pi(s'|s)\rho(I_{2,s,t-1})B_{2,s,t-1} + I_{2,s',t}$

iii. $\rho(I,j) = P_j \times \frac{\ln(I+\epsilon)-\ln(\epsilon)}{\ln(1+\epsilon)}; \epsilon = 10^{-2}; P_j \in [0, 0.3]$

iv. Cost of production: $c(q) = q^2$ (can change when there are supply shocks in leather industry).

Model

i. Cost of marketing function: $\mathbb{C}(I_{1,s,t}, \psi) = \frac{1}{\psi(\tau_{s,t}, m_{s,t})}(I_{1,s,t})^2$ and $\mathbb{C}(I_{2,s,t}, \psi) = \frac{1}{1-\psi(\tau_{s,t}, m_{s,t})} \times (I_{2,s,t})^2$.

ii. $V_j = \sum_{t=0}^{T-1} \beta^{T-1} \sum_{s=0}^{S_t} \pi_{s,t} \left(p_{j,s,t} q_{j,s,t} - c(q_{j,s,t}) - \mathbb{C}(I_{i,s,t}, \psi(.))\right) + \beta^T \sum_{s=0}^{S_2} \pi_{s,T} \left(p_{j,s,T} q_{j,s,T} - c(q_{j,s,t})\right)$

Equilibrium

Given exogenous parameters, a Bayesian Nash equilibrium of the dynamic game consists of strategies: $\{q_{j,s,t}\}$, $\{I_{j,s,t}\}\ \forall s, t, j$ such that given $\{\pi_{s,t}\}, \{Q_{j,s,t}\}, \{\alpha_{s,t}, v_{s,t}, \tau_{s,t}\}$, $\forall s, t, j$ and model primitives, firms optimize by choosing optimal marketing and production decisions and aggregate industry feasibility is satisfied with equality or inequality.

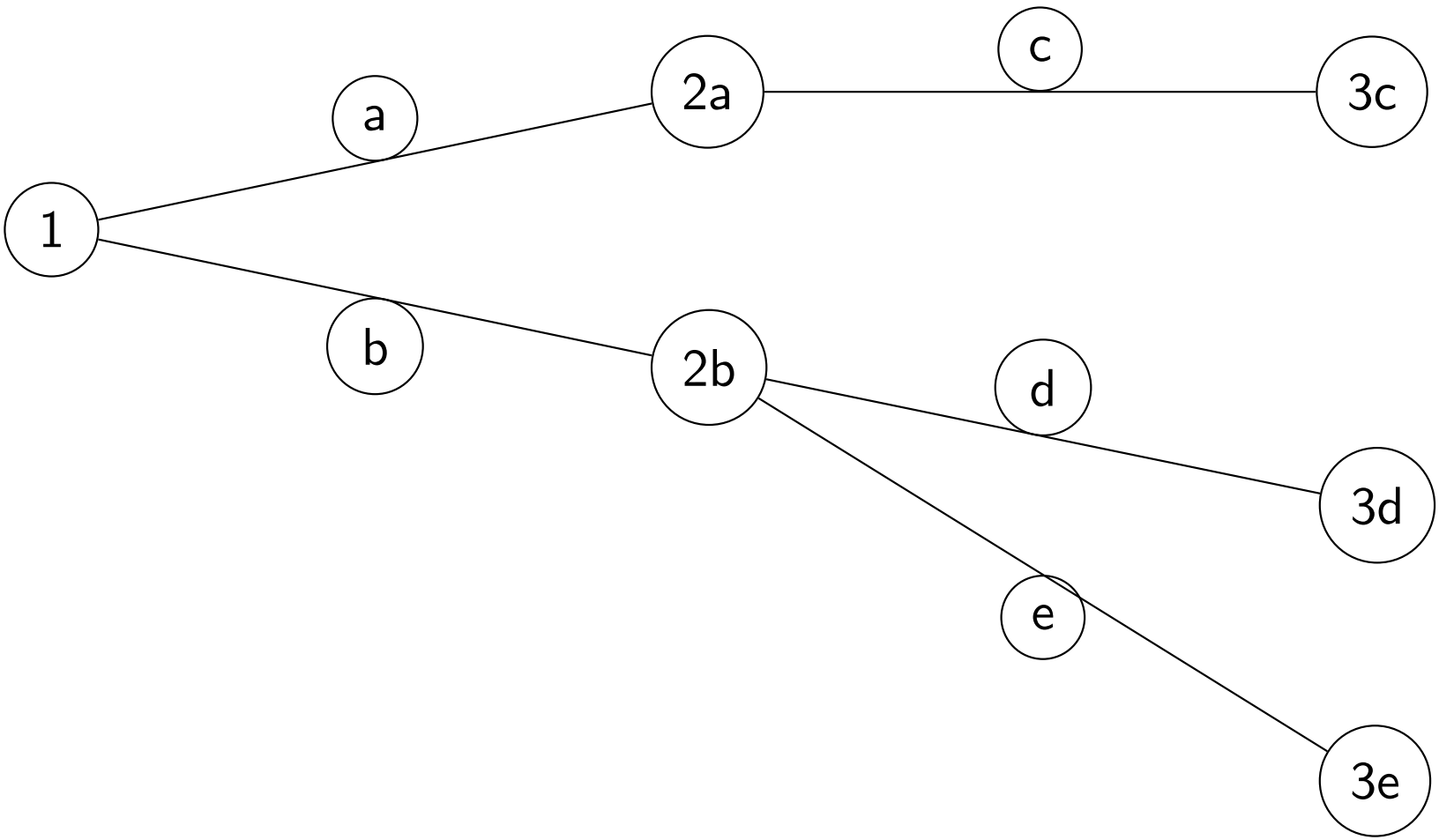
Hyperparameters

i. Initial parameters or boundary conditions:
$(\alpha_0, v_0, \beta, \tau_0, \rho_0) = (10, 2, 0.95, 0.5, 0)$.

ii. $B_{1,1,0}, B_{2,1,0} = (0.75, 0.25)$.

iii. $P_1 > P_2$.

Dynamic Game



Solving Model

i. Will use PakesMcGuire, 2001 style algorithm; since this is finite horizon game, will adapt the algorithm using **stochastic backward induction**.

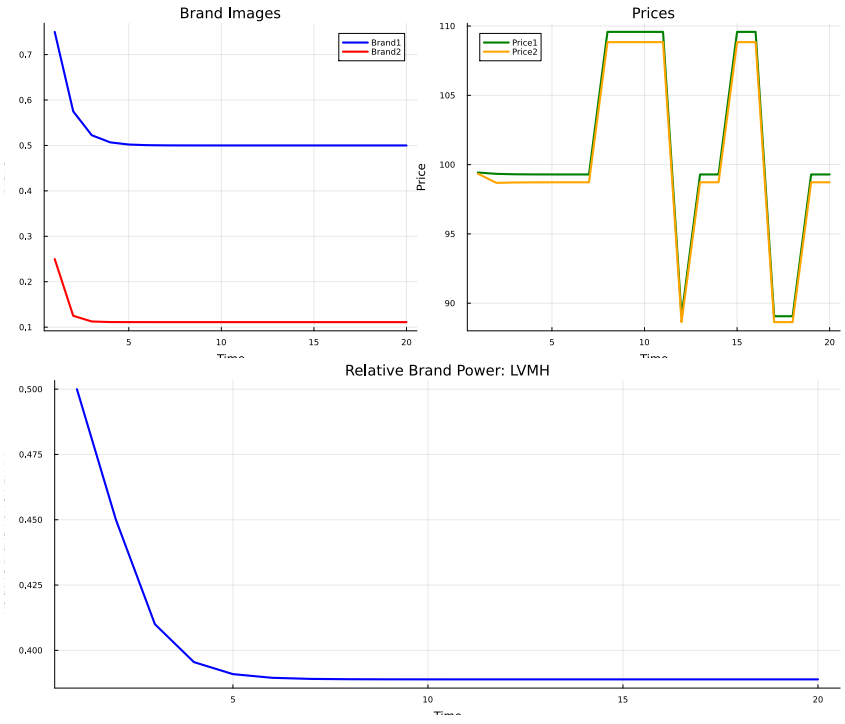
ii. My preliminary code is available here: dynamic-game.jl.

State Transitions

Normalcy, Recession and Boom are the three states: $\{s_1, s_2, s_3\}$.

$$\Pi = \begin{bmatrix} 0.70 & 0.2 & 0.1 \\ 0.1 & 0.60 & 0.3 \\ 0.25 & 0 & 0.75 \end{bmatrix}$$

Dynamic Game Solution



Figure

Empirical Estimation

i. Will web-scrap data on ads from X, Facebook and magazines: access Vogue and Harpers' Bazaar.

ii. Data on frequency of ads, pricing across firms and estimates of ad costs.

iii. Estimates of aggregate industry size using customs' imported data, HS Code: 4202, and will assume values for hyper-parameters such as discount factor.

iv. Goal is to estimate $m_{j,s,t}$, $\forall s, t$: market power dynamics and $I_{j,s,t}$ which will pin down $B_{j,s,t}$.

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