Persuasion and Norm Persistence

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Quality Certification and Norm Persistence

In the EU, around **12 kg of textiles per person** are discarded every year

- Yet the number of **EU Ecolabels** continues to increase!

Key problem: Regulation should first understand the **norms** guiding consumption behaviour.

Key Question

Can quality certification moderate "extreme norms" of consumption?

Contribution

Game of incomplete information:

1. Benchmark model à la Albano and Lizzeri (2001);
2. Dynamic information acquisition problem.

Key Innovation

Optimal policy should balance imitation of success and imitation by dissatisfaction

Benchmark Model

CONSUMERS

- Consumers carry a norm, $\gamma \in \{0, 1\}$
  - Mass of consumers with $\gamma = 1$ is n_t;
  - Mass of consumers with $\gamma = 0$ is $\overline{n} - n_t$
- Consumers with $\gamma = 1$ have marginal value v of asset quality q
- Consumers with $\gamma = 0$ do not care about quality
- Both consumers are affected by other consumers who bought the asset in the last period, z_{t-1}
- Consumers' payoff:

$$U_R := \begin{cases} 0, & \text{if don't buy} \\ v\gamma E[q|s] + v^0 + bz_{t-1} - p, & \text{if buy} \end{cases}$$

FIRM

- Firm owns an asset of quality $q \in Q \subseteq [\underline{q}, \overline{q}]$ and sets price p
- Quality is unobservable to consumers
- Cost of production $c(q, \theta)$, where $\theta \in \Theta = [\underline{\theta}, \overline{\theta}]$ is the firm's type
- Firm's payoff:

$$U_A := \max_{p,q \geq 0}\{0, \{\mathbb{E}_s[\mathbb{E}_{\hat{q}_s}(p - c(q,\theta)z_t)]|s\}\}$$

REGULATOR

- Regulator does not observe the firm's type, θ
- He commits to a certification rule, (π, Σ):
  - Finite set of signal realizations: $s \in \Sigma$, with $\Sigma < \infty$
  - Set of conditional distribution over Σ: $\pi_{q,\theta}(s)$
- Regulator's payoff:

$$U_S := n_t\left(\int_{v_1^*}^{1}(v\gamma\hat{q}_s + v^0 + bz_{t-1} - p^*)dF(v)\right) + \\ + (\overline{n} - n_t)\left(\int_{v_0^*}^{1}(v\gamma\hat{q}_s + v^0 + bz_{t-1} - p^*)dF(v)\right)$$

Equilibrium Characterisation

Market Equilibrium (Case I)

Let $q = \overline{q} = 1$ and $p > v^0 + bz_{t-1}$. Consumers with norm γ_0 do not buy. Consumers with norm γ_1 buy *iff* $v \geq \min\left\{\frac{p - bz_{t-1} - v^0}{\overline{q}}, 1\right\}$. The firm optimally sets $p^* = \frac{v^0 + \overline{q} + bz_{t-1} - c(\overline{q},\theta)}{2}$ or does not produce if $c(\overline{q}, \theta) > v^0 + \overline{q} + bz_{t-1}$.

Market Equilibrium (Case II)

Let $q = \overline{q} = 1$ and $p \leq v_0 + bz_{t-1}$. Consumers with norm γ_0 buy *iff* $p^* \leq v^0 + bz_{t-1}$. Consumers with norm γ_1 always buy if the product is offered. The firm optimally sets $p^* = v^0 + bz_{t-1}$ or does not produce.

When producing $q = \overline{q} = 1$, the firm earns profit $\pi_{\overline{q}}$:

$$\pi^*_{\overline{q}} := \begin{cases} 0, & \text{if } c(\overline{q}, \theta) > v^0 + \overline{q} + bz_{t-1} \\ \frac{(v^0 + \overline{q} + bz_{t-1} - c(\overline{q},\theta))^2}{4}, & \text{if } c(\overline{q}, \theta) \leq v^0 + \overline{q} + bz_{t-1} \end{cases} \tag{1}$$

Market Equilibrium (Case III)

Let $q = \underline{q} = 0$. Assume $c_0 = c(0, \theta) \leq v^0 \; \forall \; \theta$. Consumers with norm γ_0 and consumers with norm γ_1 buy *iff* $p^* \leq v^0 + bz_{t-1}$. The firm optimally sets $p^* = v^0 + bz_{t-1}$ or does not produce.

When producing $q = \underline{q} = 0$, the firm earns profit $\pi_{\underline{q}}$:

$$\pi^*_{\underline{q}} := v^0 + bz_{t-1} - c_0 \tag{2}$$

Dynamic Game

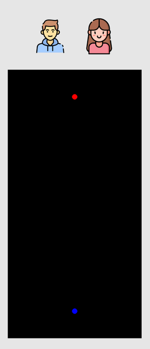
Imitation driven by success / dissatisfaction:

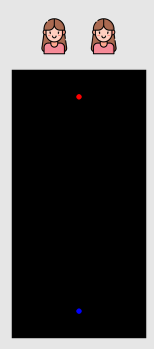
- Consumers' imitation dynamics depend on the payoff of other players in the population;
- Let n_{t+1} be the share of the population with norm $\gamma = 1$ at time $t + 1$;
- Let $\overline{n} - n_{t+1}$ be the share of the population with norm $\gamma = 0$ at time $t + 1$;

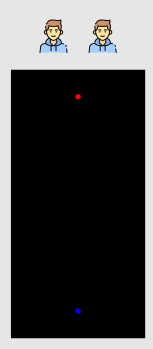
$$n_{t+1} = \begin{cases} \overbrace{(1-\epsilon)n_t}^{Success} + \overbrace{\epsilon(\overline{n} - n_t)}^{Dissatisfaction} & \text{if } u_1(n_t) > u_0(n_t) \\ (1-\epsilon)n_t & \text{if } u_1(n_t) < u_0(n_t) \\ n_t & \text{if } u_1(n_t) = u_0(n_t) \end{cases}$$

$$\overline{n} - n_{t+1} = \begin{cases} \overbrace{(1-\epsilon)(\overline{n} - n_t)}^{Success} + \overbrace{\epsilon(n_t)}^{Dissatisfaction} & \text{if } u_0(n_t) > u_1(n_t) \\ (1-\epsilon)(\overline{n} - n_t) & \text{if } u_0(n_t) < u_1(n_t) \\ (\overline{n} - n_t) & \text{if } u_0(n_t) = u_1(n_t) \end{cases}$$

Dealing with Information







Equilibrium Selection and Implications

- Candidates for long-run equilibrium are the pure-strategy equilibria of a static coordination game;
- **Not all fixed points can be selected as an equilibria** (Sandholm 2010):
  - Stable Equilibria: If the system has a single, stable fixed point, the system will tend converge to it;
  - Unstable Equilibria: If the system has multiple candidate solutions, the system will cycle indefinitely.

Next Step

How can the regulator affect norm persistence?

References

- Albano, G. L. and A. Lizzeri (2001). "Strategic Certification and Provision of Quality". In: *International Economic Review* 42.1, pp. 267–283.
- European Commission (2023). *Circular economy for textiles: taking responsibility to reduce, reuse and recycle textile waste and boosting markets for used textiles.* Available at: `https://ec.europa.eu/commission/presscorner/detail/en/ip_23_3635`. (Accessed: 17 January 2024).
- Sandholm, W. H. (2010). *Population Games and Evolutionary Dynamics.* Cambridge, MA: MIT Press.

Let's Connect!

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