

Quality choice with reputation effects: Evidence from hospices in California

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Motivation

In IO and Health literature, general interest in how firms decide product quality.

A potential factor influencing quality choice is its effect on **reputation**.

The reputation of a firm can be thought of as reflecting its past quality choices.

- Current quality $\uparrow \implies$ reputation $\uparrow \implies$ future sales \uparrow
- Tradeoff with higher current cost
- Interacts with level of competition

This leads to the broader question of how reputation impacts consumer and firm choices.

- In a market where goodwill and name recognition are important, or one where quality is not contractible, consumers rely on firms' reputations to make product choices.
- Firms respond by choosing quality and competing on reputation against their rivals in the market.

In this paper I study how consumers and firms make decisions under reputation effects in the context of hospices.

Hospices

Hospices give palliative care to terminally ill patients who opt out of curative treatment.

- Hospices serve patients at patients' residences (home/nursing facility) rather than patients going to hospices.
- Hospice staff visit the patient multiple times and make adjustments, such as pain-control, living arrangements, etc.
- More visits \implies higher quality.
 - Hospice is checking up on patients more and adjusting for day-to-day difficulties.
 - Good proxy for overall “effort” by hospice.

Overview

I estimate a structural model of reputation accumulation through quality choice by hospices, and use it to:

- Quantify the importance of reputation for consumers.
- Calculate marginal cost of hospices.
- Study policies to improve hospice quality.

Reputation decays at an annual rate of 53%, and the marginal cost of an additional visit from a hospice is roughly \$200.

Counterfactuals show that hospice quality increases with higher Medicare prices, greater persistence of reputation through review sites, and an increase in market size through an aging population.

Contributions

1. First to build and estimate a structural dynamic oligopoly model of reputation accumulation via quality choice.
 - Allows me to measure unobserved cost parameters while also clarifying how forward-looking firms compete in reputation.
2. Construct a novel way of measuring reputation using market share data.
 - In contrast with other papers that measure reputation using user reviews.
 - My approach has the advantage of not suffering from econometric issues involving user reviews.
 - Allows reputation to be studied in settings where such review data is not available.

3. Demonstrate importance of reputation when i) patients choose medical providers and ii) medical providers choosing quality.
4. Contribute to a very scarce literature on hospices.
 - Important industry for reining in healthcare expenses.
 - Large fraction of skyrocketing US healthcare cost happens on ineffective curative treatments for dying patients.
5. Studies optimal regulation in regulated price settings.
 - Similar to parts of Europe and US.
 - Similar to suggested policy changes in US.

Data on hospices in California :

- Home Health Agencies And Hospice Annual Utilization Reports.
- Coverage is 2002-2018.
- Yearly data at the firm level.
- For each hospice, I observe total patients served and the number of visits made over a year.

Combine with additional data sources on population sizes (by age), mortality rates, and Medicare hospice reimbursement rates.

$$\text{Measure of quality of a hospice} = \frac{\text{total visits}}{\text{total patients served}}$$

Hospices

Hospices are chosen through a combination of:

- Suggestions from social worker and patient's physician.
- Word-of-mouth and family's search.

Implies that reputation can be an important driver of choice.

- Quality not contractible: the hospice unilaterally decides how many visits to make.
- Hospices which have given higher quality care in the past are more likely to be known and referred by social workers and neighbors.

Majority of patients are paid for by Medicare.

- Hospices are price-takers.
- Per-diem reimbursement scheme.

Structural model: Demand

The utility of consumer i for hospice j in period t is given by:

$$u_{ijt} = \alpha_{m(j)} + X'_{jt}\beta + \psi_{jt} + \xi_{jt} + \zeta_i + (1 - \sigma)\tilde{\epsilon}_{ijt}$$

$$\xi_{jt} = \rho\xi_{jt-1} + \epsilon_{jt}$$

where ϵ_{jt} is distributed independently with mean zero.

Reputation effect is incorporated as a stock transition equation:

$$\psi_{jt} = (1 - \tau)\psi_{jt-1} + \eta a_{jt}$$

where a_{jt} is the average number of visits made by hospice j in period t .

Assuming $\psi_{j0} = 0$ (i.e. a new entrant has a reputation of zero):

$$\psi_{jt} = \eta[a_{jt} + (1 - \tau)a_{jt-1} + (1 - \tau)^2 a_{jt-2} + \dots]$$

Structural model: Supply

$$\bar{\pi}(a_j, a_{-j}, x_m; \theta) = M_m s_j(a_j, a_{-j}, x_m) [P_m^{MCAR} - MC_j(a_j)]$$

where x_m denotes the state variable in market m , a_{-j} denotes the vector of realized actions of all rival firms in the market, and M_m is the market size.

Structural model: Supply

Marginal cost of a hospice depends on their quality choice, type, and other characteristics.

$$MC_j(a_j) = \gamma_0 + \left(\gamma_{ak} + \gamma_{fp} FP_j + \gamma_{rural} RURAL_j \right) a_j$$

where k denotes the type of the hospice.

Structural model: Supply

The incumbent's value function is:

$$V_j(x_m, \epsilon_j^a; \theta) = \max_{a_j \in \mathcal{A}} \mathbb{E} \left[\bar{\pi}(a_j, x_m; \theta) + \epsilon_j^a(a_j) + \beta V_j(x'_m, \epsilon_j'^a; \theta) \mid a_j, x_m \right]$$

where θ is the set of structural parameters affecting a hospice's per-period payoff and $\epsilon_j^a(a_j)$ is the choice-specific errors for hospice j choosing action a_j .

Assume these shocks are *i.i.d* and distributed Type-1 Extreme Value.

Results: Demand

$$u_{ijt} = \alpha_{m(j)} + X'_{jt}\beta + \psi_{jt} + \xi_{jt} + \zeta_{ih} + (1 - \sigma)\tilde{\varepsilon}_{ijt}$$

$$\xi_{jt} = \rho\xi_{jt-1} + \epsilon_{jt}$$

$$\psi_{jt} = (1 - \tau)\psi_{jt-1} + \eta a_{jt}$$

	Demand
τ	0.530 (0.156)
ρ	0.756 (0.072)
σ_n	0.597 (0.034)
η	0.012 (0.003)

Table 1: Results of demand estimation

Results: Supply

$$MC_j(a_j) = \gamma_0 + \left(\gamma_a + \gamma_{fp}FP_j + \gamma_{rural}RURAL_j \right) a_j$$

$$MC_j(a_j) = \gamma_0 + \left(\gamma_a + 1(type_j = 2)\gamma_{a2} + \gamma_{fp}FP_j + \gamma_{rural}RURAL_j \right) a_j$$

	No types	With cost-types
γ_a	1343.728 (32.311)	1541.100 (48.872)
γ_{FP}	-740.676 (93.892)	-532.156 (116.642)
γ_{rural}	125.534 (54.289)	206.063 (74.825)
γ_{a2}		-594.847 (111.097)

Table 2: Results from dynamic supply estimation

Counterfactuals:

1. Firms choose higher quality as prices increase, but a firm's response depends on how differentiated it is in terms of characteristics compared to its competitors.
2. As reputation decays faster, hospices choose lower quality.
3. Under reputation effects, hospices choose higher quality than the static case with no reputation.
4. Greater market size due to an aging population raises hospice quality.