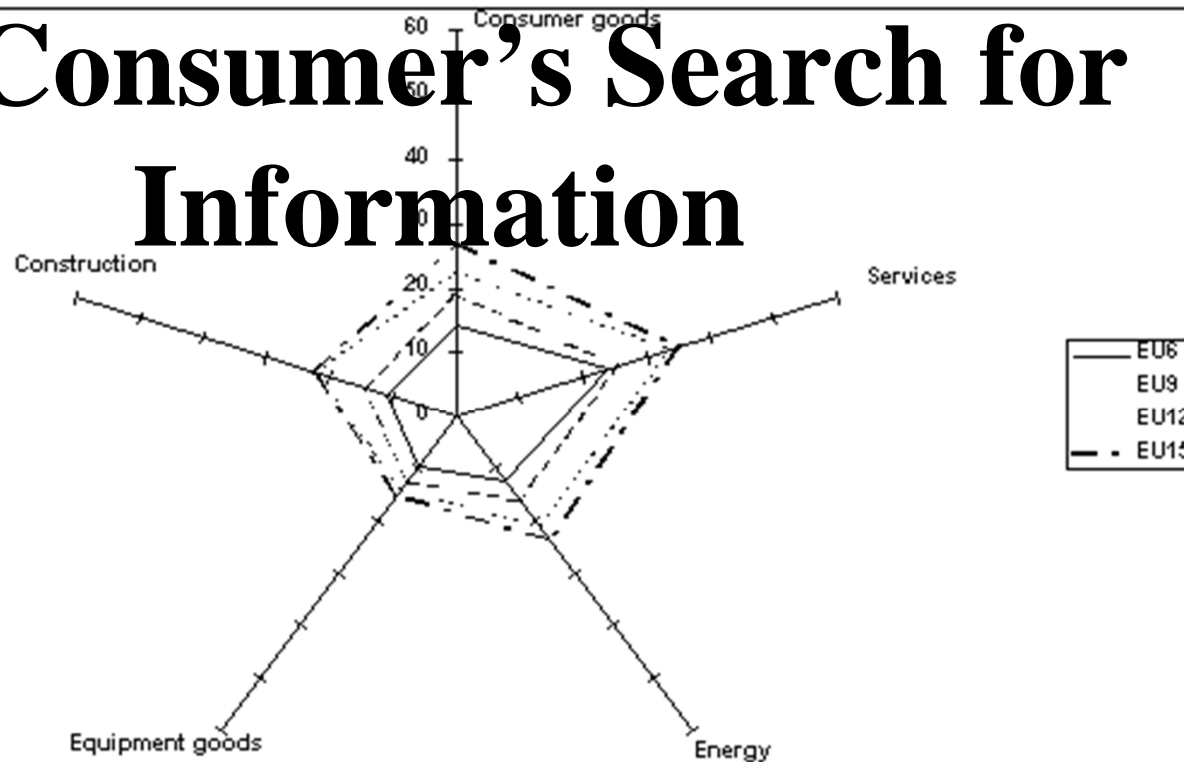# Price Dispersion, Competition and Consumer's Search for Information

Price Dispersion and Competition

Stigler, G. (1961)

Price dispersion is a manifestation, and indeed it is the measure, of ignorance in the market.

Kuttner, R. (1998)

The Internet is a nearly perfect market because information is instantaneous and buyers can compare the offerings of sellers worldwide. The result is fierce price competition, dwindling product differentiation, and vanishing brand loyalty.

1. Introduction

Law of one price: unique price equilibrium

But prices vary: dynamic pricing, versioning

Frictionless efficient e-commerce

 Physical location not important

 Full price information for consumers

 Zero economic profit: very heavy price competition

Internet related retail sales in 2005 (worldwide)

 $650B

 About 20% of total sales

1. Introduction

Ideal world for consumers not inevitable

Dynamic pricing

High e-commerce stock valuation

Virtual location is important - Differentiate the price

Internet markets are efficient

↓ search cost

↓ costs of market entry

↓ operating costs

1. Introduction

Important questions

Will Internet competition ↓ prices?

Is there smaller price dispersion?

Can online retailers adjust prices more readily related to menu cost?

1. Introduction

Road map

Market function and Internet

Model search costs

Empirical evidence of Internet efficiency

Sources of price dispersion

Role of intermediaries

2. Market functions

Market create values for society

    (1) Match buyers and sellers

    (2) Facilitate exchange of goods and services

    (3) Institutional infrastructure (legal finential infra)

Interested in (1)

    i)   Determining product offerings

    ii) Search

    iii) Price discovery

2. Market functions

i) Product offerings

Based on

Information about buyer demand

Input costs and available technology

t-costs

2. Market functions

ii) Search

Buyers search for information

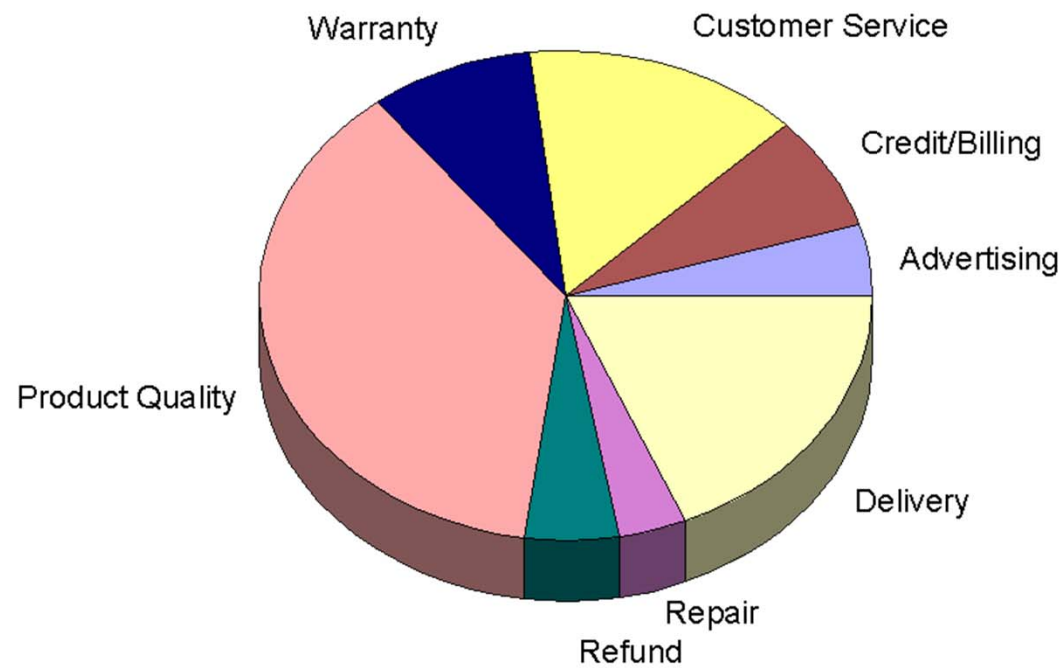   Opportunity cost of time

    Expanses

    Risks (of going to unknown supplier)

    Psychological cost (to move over to different supplier)

Sellers exploit buyer search costs

Internet E-Commerce

2003 Complaints

2. Market functions

Sellers face their own search costs

Advertisement

Market research

Setting up new accounts

Credit risk: customers' don't pay

2. Market functions

iii) Price discovery

Auctions: livestock, marine products, flowers

Negotiation

Take-or-leave price

2. Market functions

iv) How the Internet affects markets

Lowers buyers search costs

Lowers sellers search costs

Specialized search engines

Direct link to manufacturer web site

Internet-based technology: purchase, payment, delivery,…

Promote price competition

2. Market functions

Industrial Organization theory suggests other mechanism

- Low costs of market entry

- Low MES (Minimum Efficiency Scale)

- Low operation costs

2. Market functions

v) Summary

↓ Search costs promotes price competition

Homogeneous online market/goods

Seller can't use geography or ignorance to differentiate between different consumers

However, new sources of differentiation

Dynamic costs

Switching costs

Lock-in

3. Model of Search and Price Dispersion

Price information is costly

Compare cost to benefit

Different search costs by different customers

Internet ↓ search costs

    Less differentiation: more homogenous goods

    Less price dispersion

    Prices converge to cost

3. Model of Search and Price Dispersion

i) Normal game

Set of players

Each player has an action set

    Actions determine the outcome

Each player has a payoff

    Assigns a value to every outcome of the game

Equilibrium

3. Model of Search and Price Dispersion

ii) Nash Equilibrium (NE)

An outcome is said to be a NE when no single player would find it beneficial to deviate, provided all other players do not deviate from their strategies played at the Nash outcome
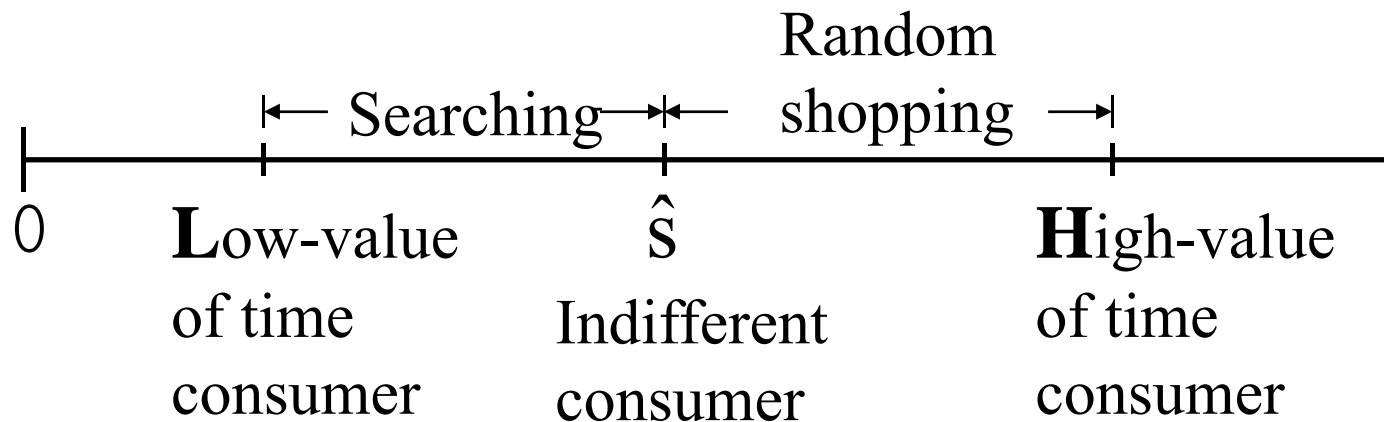

John Nash, Nash Equilibrium

3. Model of Search and Price Dispersion

iii) Model Assumption

Continuum of consumers $[L, H]$, $0 < L < H$

3. Model of Search and Price Dispersion

Two stores

Discount store (D): cost = C, price = P_D

Non-discount store (ND): cost = C, price = P

Average price: $\bar{p} = (P_D + P)/2$

3. Model of Search and Price Dispersion

Search or no: Minimize the loss function

$$L(S, \overline{p}) = \begin{cases} P_D + \alpha S: \text{search} \\ \overline{p}: \text{random shopping (no search)} \end{cases}$$

α: search time

S: unit search cost

Consumer will search for the lowest price when

$$P_D + \alpha S \leq \overline{p}$$

Consumer buys randomly when

$$P_D + \alpha S \geq \overline{p}$$

3. Model of Search and Price Dispersion

Indifferent Consumer

$$P_D + \alpha S = \overline{p} = (P_D + P)/2$$

$$\hat{S} = (P - P_D)/2\alpha$$

$S \in [L, \hat{S}]$: search

$S \in [\hat{S}, H]$: random shopping

3. Model of Search and Price Dispersion

Discount Store

$$E(q_D) = (\hat{S} - L) + (H - \hat{s})/2$$

$$E(\pi_D) = (P_D - C)E(q_D)$$

$$= (P_D - C)(H/2 - L + (P - P_D)/4\alpha)$$

From $\partial E(\pi_D)/\partial P_D = 0,$

$$P_D = R_D(P) = C/2 + \alpha(H - 2L) + P/2$$

"Best response function": Price that maximize
Discount store's profit given Non-discount
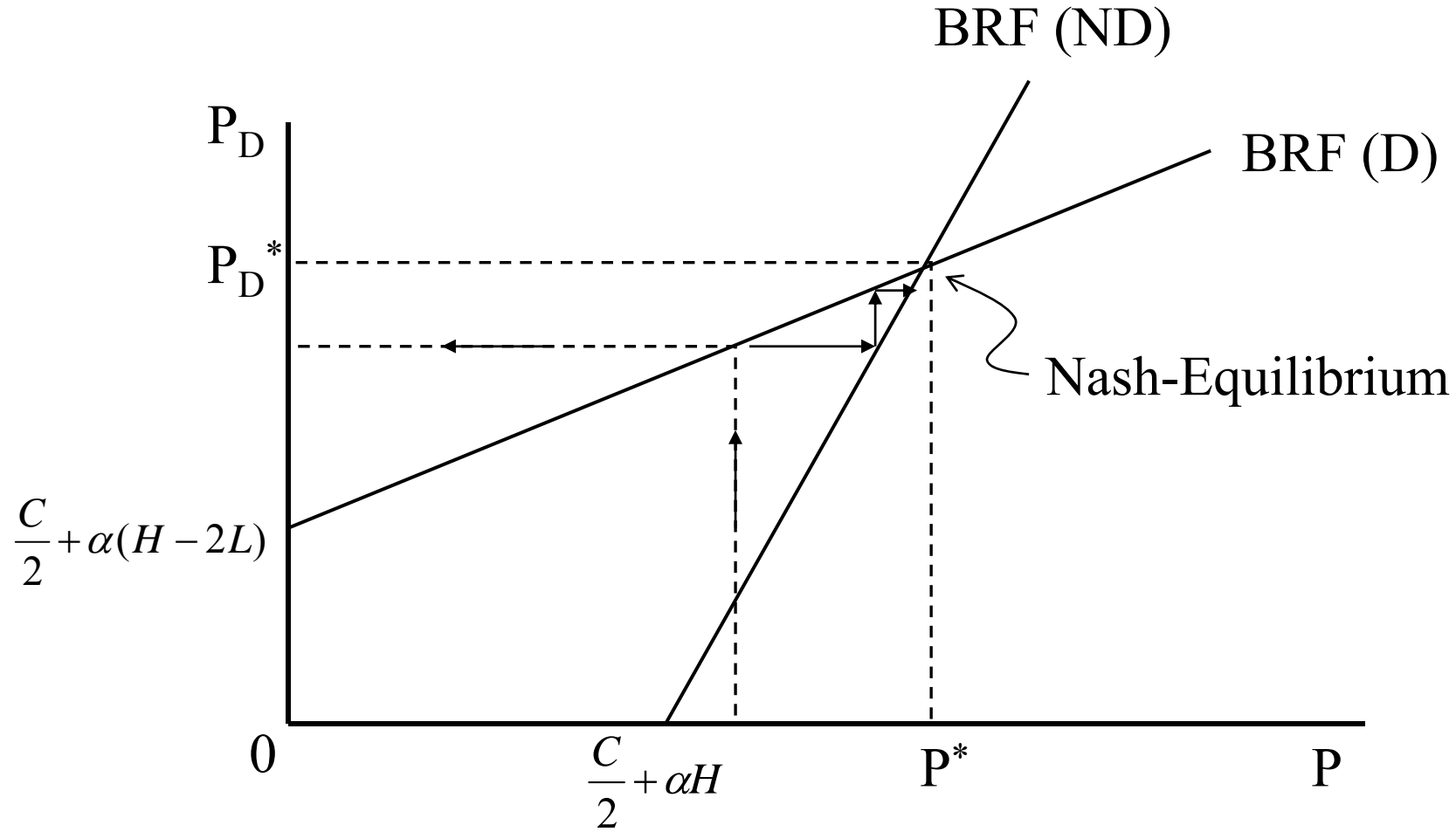store's price

23

3. Model of Search and Price Dispersion

Non-discount Store

$E(q) = (H - \hat{S})/2$

$E(\pi) = (P - C)(H - \hat{S})/2$

$P = R(P_D) = C/2 + \alpha H + P_D/2$

3. Model of Search and Price Dispersion

BRF (ND)

BRF (D)

P_D

$P_D{}^*$

$\dfrac{C}{2}+\alpha(H-2L)$

Nash-Equilibrium

0

$\dfrac{C}{2}+\alpha H$

P^*

P

3. Model of Search and Price Dispersion

Nash Equilibrium

$P_D* = C + 2\alpha H - 8\alpha L/3$

$P* = C + 2\alpha H - 4\alpha L/3$

$P* - P_D* = 4\alpha L/3$

Search time $\alpha \rightarrow 0$,

$$P_D* = P* = C, P - P_D* = 0$$

3. Model of Search and Price Dispersion

Proposition 1

An Internet-induced reduction in search time α should lower differentiation, price dispersion, and should lead to prices closer to cost in on-line markets

3. Model of Search and Price Dispersion

Proposition 2

An increase of the search time α will increase the number of consumers who search for the discount store

$\alpha \uparrow$, $P^* - P_D^* = 4\alpha L/3 \uparrow$

Discount store market share $\uparrow$: more consumers searching

ND store market share $\downarrow$

3. Model of Search and Price Dispersion

v) summary

Advances in IT that lower search costs

   Greater price competition

   Less price dispersion

   Prices closer to cost

Compare pricing across online and offline markets

Lower search costs in online markets

Lower costs in online markets

Dynamic pricing

3. Model of Search and Price Dispersion

$\alpha_{online} < \alpha_{offline}$

Lower price levels in online market

Less price dispersion

More price changes (low menu cost) and smaller
increments

4. Price evidence for online and offline markets

Many conduits for lower (higher) prices

Empirical questions

Will Internet competition ↓ prices?

Is there smaller price dispersion?

Can online retailers adjust prices more readily?

Compare prices in online and offline markets

4. Price evidence for online and offline markets

i) Price levels

Bailey (1998)

    Books, CDs, Software, 1996/97

    Higher online prices

    Market immaturity and lack of competition

Brynjolfsson and smith (2000)

    Books, CDs 1998/99

    Lower online prices

    Internet market more efficient

4. Price evidence for online and offline markets

ii) Menu costs and price discrimination

Lower menu costs

    More price adjustments

    Smaller increments

Bailey (1998)

    Online makes more changes

Brynjolfsson and Smith (2000)

    Online price changes with 100 times smaller
      increments

4. Price evidence for online and offline markets

iii) Price dispersion

Bailey, Brynjolfsson and Smith

    Online price dispersion is not lower

    Market immaturity

    Heterogeneous retailers, trust, brand awareness

Clemons et al. (1998)

    Online air travel tickets

    Control for heterogeneity

    Prices vary by up to 20%

5. Sources of Price Dispersion in Online Market

Presence of price dispersion

    i)   Product heterogeneity

    ii) Awareness

    iii) Branding and trust

    iv) Switching costs and lock-in

5. Sources of Price Dispersion in Online Market

(i) Product heterogeneity

Differentiation (of service even with the same book)

Amazon's enhanced service

Several studies for heterogeneity

Still find price dispersion

Other factors lead to price dispersion

Hedonic pricing:

price = f (attributes, characteristics, …)

5. Sources of Price Dispersion in Online Market

ii) Awareness

Customers awareness

'Neural real estate'

Many e-tailers are hidden

Strong awareness leads to higher prices

5. Sources of Price Dispersion in Online Market

iii) Branding and trust

Overcome spatial and temporal separation

Pay a premium to trusted retailers: credit card

Signal trust

Online communities signal reputation

Unbiased customer feedback

Links from other trusted sites

Association with conventional names

5. Sources of Price Dispersion in Online Market

iv) Switching costs and lock-in

Leverage switching-costs