Price posting over the industry life cycle

Boyan Jovanovic
NYU

AEA meetings, Atlanta, January 2010
Asymmetric equilibria in price setting

Prescott *JPE* ‘75
Butters *RES* ‘77

Effect of money shocks in such models

Eden *JPE* ‘94

Other models

Burdett & Judd *Econometrica* ‘83
Burdett Mortensen *IER* ‘98
Argument:

1. In young industries demand curve is unknown

When

2. Prices have to be posted a period in advance

3. Customers know prices (i.e., have zero search costs)

Then

A. price dispersion declines as the industry gets older.

B. markups fall with industry age.
Combine Rob (RES ‘91) with price commitment as in Prescott (75)

Prescott 75: Assumptions of the model:

- \( n \sim F(n) \) number of customers

- \( c \) = cost of preparing the room.

- One room per hotel;

- Zero search cost. All customers informed

No single-price equilibrium
Demand curve
Let

\[ S(p) \equiv \# \text{ hotel rooms costing } \leq p \]

Zero profit

\[ c = p \left( 1 - F[S(p)] \right) \]

\[ S(p) = F^{-1} \left( 1 - \frac{c}{p} \right) \quad \text{for } p \in [c, \bar{p}] \quad (1) \]
Dynamics Rob (RES 91) plus price posting one period ahead

\[ c = \text{cost of a unit cost of new capacity} \]

\[ x = \text{industry investment} \]

\[ k' = k + x \]

- If \( k \) ever exceeds \( n \), price falls to zero permanently.

Highest-price seller always charges \( \bar{p} \)

\[ v(k) = \text{pre-crash value of capital of the highest-price seller} \]

entry if industry capacity = \( k \)

\[ v(k) = \bar{p} + c \]

free entry \[\implies\]

\[ v(k) = \bar{p} + c \]
Learning:

\[ \Pr(n \geq n' \mid n > k) = \frac{1 - F(n')}{1 - F(k)}. \] (2)

Therefore,

\[ c = \Pr(n > k + x \mid n > k) \beta (\bar{p} + c) \]

Equilibrium difference equation for capacity solves

\[ \frac{1 - F(k')}{1 - F(k)} = \frac{c}{\beta (\bar{p} + c)} \] (3)

Price distribution \( x(p) \) solves

\[ c = \beta \left[ \frac{1 - F(k + x(p))}{1 - F(k)} p + \frac{1 - F(k + x(\bar{p}))}{1 - F(k)} \right] \] (4)
EXAMPLE: Pareto

\[ F(n) = 1 - \left(\frac{n}{n_m}\right)^{-\rho}. \]

with \( \rho > 1 \)

\[ E(n) = n_m \frac{\rho}{\rho - 1}, \quad \text{and} \quad E(n \mid n \geq k) = k \frac{\rho}{\rho - 1}, \]

Then capacity evolution

\[ k_{t+1} = \beta \left(1 + \frac{\bar{p}}{c}\right)^{1/\rho} k_t \]

Then growth rate increases with \( \beta, \bar{p} \), decreases with \( c, \rho \). The density of prices is

\[ A_{\rho}^{(1-\rho)/\rho} \]

The fraction of firms at the spike =

\[ \frac{k_t}{k_{t+1}} \]

The Pareto hazard is \( \frac{\rho}{n} \)
before saturation: $1/(1+g)$

after saturation: $1$
Implications

1. Right-skewed price distributions of markups with spike at zero
2. Variance of markups falls as industry ages
3. Effects of money shocks and aggregate shocks?
Eden’s price-rigidity hypothesis

“The Adjustment of Prices to Monetary Shocks when Trade is Uncertain and Sequential.”
Eden’s hypothesis + this model

1. Frequency of price changes rises as the industry gets older

2. Older firms should change prices more often
Evidence

1. Do large firms charge less (for the same product)?

2. Are markup distributions skewed to the right?

3. Does “sudden saturation” occur?
Do large plants have lower markups?
Fig. 1. Kernel price regressions
Are price distributions skewed to the right?
**Fig. 1a.** Density of the Output Price Distribution by year.

**Fig. 1b.** Density of the Output Price Distribution by year.

**Fig. 1c.** Density of the Output Price Distribution by year.

**Fig. 1d.** Density of the Output Price Distribution by year.
Fig. 1e. Density of the Output Price Distribution by year.

Fig. 1f. Density of the Output Price Distribution by year.

1978-79

(b)

26 Food Products in Israel

1980-81

1991-92

Observations
1978–1979
6192
1981–1982
6672
1991–1992; comparable
6096

Source: Benjamin Eden “Inflation and Price Adjustment: An Analysis of Microdata” 
Figure 2: Density of Euro 95 raw and residual prices in the Netherlands

Does saturation occur suddenly?
Does output stop growing at shakeout?

Klepper & Graddy (RAND 90) – no regime shift at shakeout

Horwath, Schivardi, Voywode (IJIO 01)– yes – beer industry case