Product Markets and Industry-Specific Training

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Introduction

- Firm-sponsored general worker training used to be regarded as a puzzle (Becker 1964, Mincer 1974)
- Various recent resolutions relying on asymmetric information or, more generally, on a compressed wage structure (Acemoglu and Pischke (1999))
- Industry-specific training in imperfectly competitive markets seems more difficult to explain $\longrightarrow$ training helps competitors

Introduction

- We provide a new explanation of industry-specific training
- We show that intense product market competition may destroy training

Intuition:

- Large number of trained workers tends to reduce wages, which makes it less costly to prevent turnover
- With intense competition, firms are reluctant to provide this public good

Related Literature

General point:

Situations that reduce turnover are conducive to training

- unions (Booth et al. 2005)
- large firms (Bassanini et al 2005)
- periphery locations (Brunello and Gambarotto, 2007)

The Model

Period 1: Firms $i = 1, 2$ choose number of trained workers g^i, unit training costs I

Period 2: Individual wage offers$\longrightarrow$
workers choose firm with higher wage $\longrightarrow$
new number of trained workers n^i

Period 3: Product market competition $\longrightarrow$
gross profits $\pi^i(n^i, n^j)$

Logic: training reduces marginal costs and thereby affects profits

Maintained Assumptions

Assumption 1: $\pi^i(n^i, n^j)$ weakly increasing in n^i, weakly decreasing in n^j

Assumption 2: $\pi(n, n)$ weakly increasing in n

(DRAW): Marginal value of poaching

$v(n^i, G) = \pi(n^i + 1, G - n^i - 1) - \pi(n^i, G - n^i)$

is decreasing in n^i

Intense competition for workers

Definition

Competition for trained workers is intense if

$$\pi(n+1, n-1) - \pi(n, n) > \frac{\pi(n, n) - \pi(0, 0)}{n} \text{ for all } n > 0$$

Note: Condition depends on

- product market (closeness of substitution, transportation costs, market size)
- training technology

The wage-bidding game

Theorem

For any initial distribution of trained workers
(i) In equilibrum, the trained workers spread evenly across firms
(ii) $w^*(\frac{G}{2}, G) = v(\frac{G}{2}, G)$

Note:

- Result is driven by DRAW
- Wage is high when value of escaping competition is high

The (marginal) value of training

Lemma

For $G = g^i + g^j$, *firms obtain long-term payoffs*

$$\Pi(g^i, g^j) = \pi(\frac{G}{2}, \frac{G}{2}) - \frac{G}{2} v(\frac{G}{2}, G) - g^i I.$$

Higher training thus

- increases own gross profits $(\frac{1}{2}\frac{\partial \pi}{\partial n^i})$
- increases competitor gross profits $(\frac{1}{2}\frac{\partial \pi}{\partial n^j})$
- requires wage payments for marginal worker $(-\frac{1}{2}(\frac{\partial \pi}{\partial n^i} - \frac{\partial \pi}{\partial n^j}))$
- changes wages for inframarginal workers $-\Delta w$

Note: training incentive requires $\Delta w < 0$ and $|\Delta w| > \left|\frac{\partial \pi}{\partial n^j}\right|$.

No-Training Equilibrum

Theorem

An equilibrum without training exists if and only if

$$\pi(n,n) - n \cdot v(n,2n) - 2nI \leq \pi(0,0) \text{ for all } n > 0.$$

Note:

- If deviating firm trains 2n workers,
  - gross profit is $\pi(n,n)$
  - wages are $v(n,2n)$
- Thus, equilibrum without training exists for intense competition:

$$\frac{\pi(n,n) - \pi(0,0)}{n} < v(n,2n)$$

Training Equilibrum

Theorem

If

$$\pi(n,n) - n \cdot v(n,2n) - 2nI > \pi(0,0)$$

for some n, then an equilibrum with training exists.

Thus: Soft competition is necessary for training equilibrum
Note: There may be multiple equilibria

Example 1: Price competition (Homogenous)

With homogenous price competition, competition for trained workers is intense because

$$\begin{aligned} \pi(n+1,n-1)-\pi(n,n) &> \frac{\pi(n,n)-\pi(0,0)}{n} \Leftrightarrow \\ \pi(n+1,n-1) &> 0. \end{aligned}$$

Hence, there is no training.

Example 2: Heterogenous firms

$$D_i(p_i, p_j) = A - 10p_i + p_j; A \in [0, 30]$$

$$c_i = 2\exp(-n_i)$$

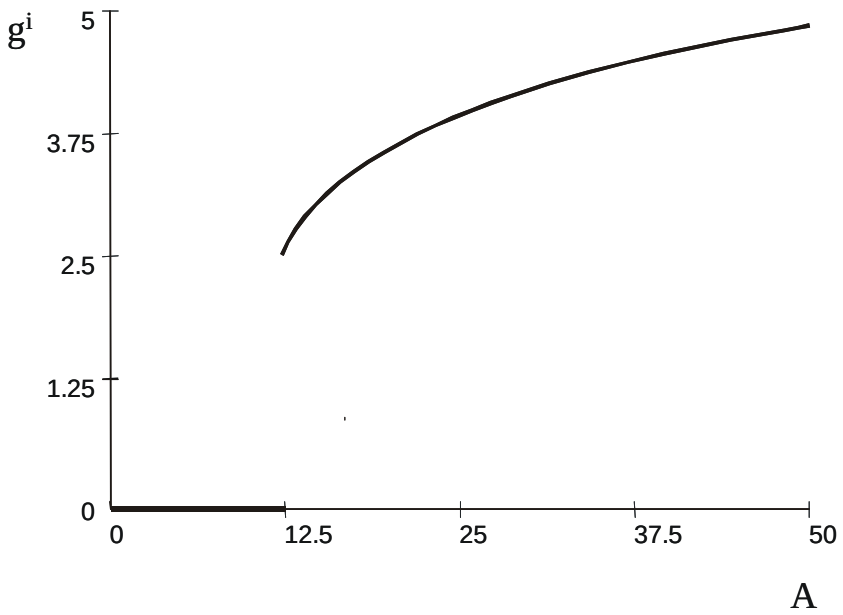

Figure: Equilibrum Training Levels

Towards empirical testing

Indirect evidence:

- costs of preventing turnover matter
- soft competition reduces these costs

Problems of direct tests:

(1) Standard measures of competition (Herfindahl, Lerner Index) are endogenous, affected by training!

(2) Correspondence between our measure and empirical counterparts?

Towards empirical testing

Ideal strategy:

(1) Take exogenous change in competition that affect some firms more than others
(e.g. Swiss Cartel Law 96, Bühler et al. 2005)

(2) Check whether affected firms reduce training more than others.