Lecture notes on economic institutions compared
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NEEDS vs PERFORMANCE

Symbol list

y	income per member
e	work effort
h	social care
Q	production
C	total cost of non-labor inputs
v_k	use of input k
p_k	price per unit of input k
L	total labor input in efficiency units
N	number of members

Equations

Narrow (egoistic) preferences

$$U = y - c(e) \tag{1}$$

Extended preferences including social care

$$V^j = U^j + \sum_{i \neq j} h_i^j U^i \tag{2}$$

Everybody identical

$$V = U + h(N-1)\hat{U} \tag{3}$$

A measure of (average) social care

$$S = \frac{1 + h(N-1)}{N} \tag{4}$$

Production funtion

$$Q = Q(L, A, v_1, \ldots, v_n) \tag{5}$$

is assumed to have constant returns to scale (CRS): Non-labor costs are given by

$$C = \sum_{k=1}^{n} P_k v_k \tag{6}$$

Social welfare (utilitarian)

$$W = N(y - c(e)) \tag{7}$$

Total use of labor in efficiency units

$$L = eN \tag{8}$$

Income per member

$$y = \frac{Q - C}{N} \tag{9}$$

Social optimum

Maximize

$$W = Q(eN, A, v_1, \dots, v_n) - \sum_{k=1}^{N} P_k v_k - c(e)N \tag{7'}$$

First order conditions

$$Q_L = c'(e) \tag{10}$$

$$Q_k = P_k, \quad k = 1, 2, \dots, n. \tag{11}$$

Distribution according to needs.

Each member gets

$$y = \frac{Q - C}{N}$$

inserted in (3) yields

$$V = \frac{Q - C}{N} - c(e) + h(N - 1)\left[\frac{Q - C}{N} - c(\bar{e})\right] \tag{12}$$

First order condition for maximum V with respect to e (taking $\bar{e}$ as given)

$$SQ_L = c'(e) \tag{13}$$

where S is given from (4) and where e that solves (13) is equal to $\bar{e}$ in equilibrium.

Distribution according to work.

Work related pay is here defined as

$$y = \frac{Q - C}{L} e \tag{14}$$

which inserted in (3) gives us

$$V = \left(\frac{Q - C}{L}\right) e - c(e) + h(N-1)\left[\left(\frac{Q - C}{L}\right)\hat{e} - c(\hat{e})\right] \tag{15}$$

First order condition for maximum of V with respect to e (taking $\hat{e}$ as given),

$$\frac{dV}{de} = \frac{Q - C}{L} + Q_L\frac{e}{L} - \left(\frac{Q - C}{L^2}\right) e - c'(e) + h(N-1)\left[\frac{Q_L}{L}\hat{e} - \frac{Q - C}{L^2}\hat{e}\right] = 0 \tag{16}$$

where $e = \hat{e}$ in equilibrium. Since $L = N\hat{e}$ we can write (16) as

$$Q_L\left[S + (1-S)\frac{\beta}{\eta}\right] = c'(e) \tag{17}$$

where

$$\beta = \frac{Q - C}{Q}, \quad \text{and} \quad \eta = \frac{Q_L}{Q} L \tag{18}$$

Here $\beta \geq \eta$ since (i) $1 = \eta + e_A + \sum_{k=1}^{n} e_k$ from CRS in (5), (ii) from (11) and (i)

$$\eta + e_A = \frac{Q - \sum_{k=1}^{n} P_k v_k}{Q} = \beta$$

which proves that $\beta \geq \eta$ since $e_A \geq 0$.

A robust mix.

Consider a mixture of the two compensation systems with the weight α on needs and the weight $(1-\alpha)$ on work performance, such that

$$y = \alpha\frac{Q - C}{N} + (1-\alpha)\frac{Q - C}{L} e \tag{19}$$

Inserted in V, we can calculate the first order condition (which just follows from combinding (13) and (17))

$$Q_L\left[S + (1-\alpha)(1-S)\frac{\beta}{\eta}\right] = c'(e) \tag{20}$$

Now, from (20) and (10) we see that when α is chosen such that

$$1 - \alpha = \frac{\eta}{\beta} \tag{21}$$

we obtain social optimum irrespective of the value of S.