

## Chapter 8 – Employment, unemployment and wages

The birth of Fordism (5/1/1914):

- ⇒ wages were more than doubled
- ⇒ working hours were reduced

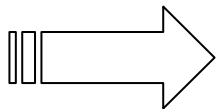
Consequences:

- ⇒ increase in the queue of job applicants
- ⇒ reduction of turnover (from 50000 to 5000 quits, from 8000 to 27 firings)
- ⇒ increase in productivity.

Such an episode cannot be accounted in a Walrasian world where a profit maximising manager selects inputs by equating marginal productivities to exogenously given prices.

What is absent from Walras' view ?

- \* "...what are traded in the market are not, as often supposed by economists, physical entities, but the rights to perform certain actions" (Coase).
- \* employment contracts do not concern the amount or quality of work done, but the hours of submission to the authority of the employer (Marx)
- \* writing down a complete contracts is more costly than transferring authority about the tasks to be performed (Simon).



A model of effort regulation/labour discipline based on contingent renewal. The problem arises whenever effort cannot be contracted because it can be observed only for a given cost. And effort is valuable for the employer

Individual level production (i.e. self-employment) would make the worker a residual claimant (thus solving the underlying conflict of interest), but economies of scale may render this solution non viable.

Define  $e \in [0,1]$  the level of effort per hours of work (for example, the fraction of time when really producing). Then the actual labour input is  $eh$ , where  $h$  is the number of hours/workers (labour measured in *efficiency units*).

Per period output is

$$y = y(he) + \varepsilon, \quad y' > 0, y'' < 0, \varepsilon \sim (0, \sigma)$$

Output is contractible, but effort cannot be inferred because of the stochastic disturbance and because the team production.

Sequence of actions:

i) knowing the worker best response function (*incentive compatibility*) the employer proposes a hourly wage rate  $w$ , a level of monitoring per hours of work  $m$  and a firing policy based on a termination probability  $t(e, m)$ ,  $t_e < 0, t_m > 0$ . A simplified version is  $t(e, m) = \eta(m)(1 - e)$ .

ii) given the contract offer, the worker selects the level of effort that maximises her utility

iii) production takes place, the worker is paid the promised wage, and the employment is terminated with the probability  $t(e, m)$ .

iv) If the job is terminated, the worker obtains the present value of lifetime utility  $z$ , and is replaced by an identical (previously unemployed) worker. Otherwise the same interaction takes place the next period.

## The worker's best response function

Per period utility function

$$u = u(w, e), \quad u_w > 0, u_e < 0$$

Present value of expected utility over an infinite horizon

$$v = \frac{u(w, e) + (1 - t(e))v + t(e)z}{1 + i}$$

or rearranging

$$v = \frac{u(w, e) - iz}{i + t(e)} + z$$

Present value of a job = *employment rent* + *fallback position*. The worker selects the level of effort by maximising her expected utility

$$\max_e v \quad \Rightarrow \quad u_e = t_e(v - z) \quad \Rightarrow \quad e = e\left(\begin{matrix} w, t, z \\ + + - \end{matrix}\right)$$

Example:

Per period utility  $u = w - \frac{aw^f}{1 - e}$  where  $w^f$  is a “fair wage”.

Fall-back position  $z = 0$  for simplicity.

Rate of time preference  $i = 0$  for simplicity.

Monitoring is costless  $t = 1 - e$

$$\text{Then } v = \frac{u(w, e)}{t(e)} = \frac{w - (aw^f / w)(1 - e)^{-1}}{1 - e}.$$

By maximising  $v$  with respect to  $e$  we obtain the best response function

$$e = 1 - \frac{2aw^f}{w^2} = e\left(\begin{matrix} w^f, w \\ - + \end{matrix}\right)$$

## The choice of the employer

Given a unitary price for the output, the profits is defined as

$$\pi = y(he(w, m, z)) - (w + m)h$$

The first order conditions for a maximum are

$$\pi_h = y'e - (w + m) = 0$$

$$\pi_w = y'he_w - h = 0$$

$$\pi_m = y'he_m - h = 0$$

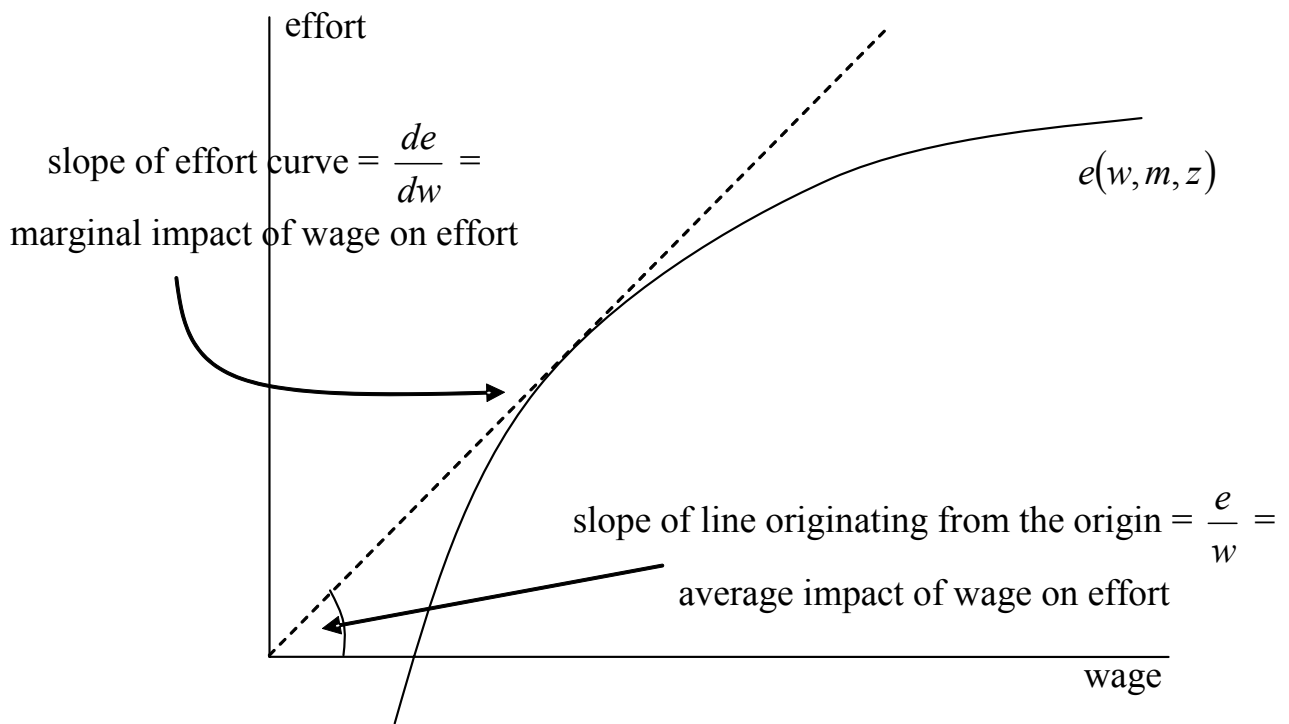
which can be summarised as

$$e_w = \frac{e}{w + m} = e_m$$

$$y' = \frac{w + m}{e}$$

The first condition is known as Solow's condition (the instrument – wage or monitoring – has to be varied up to the point where the marginal impact is equal to the average impact).

The second is the traditional equality between marginal productivity of labour and its cost (in terms of efficiency unity, including the monitoring cost).



Example:

Remember that  $m = 0$ . Then

$$\frac{e}{w} = \frac{1 - 2aw^f / w^2}{w} = \frac{4aw^f}{w^3} = e_w$$

giving the optimal wage  $w^*$  as

$$w^* = \sqrt{6aw^f}$$

If we observe a more complex technology including capital (like  $y = y(he, k)$ ) conclusions are unaffected  $\rightarrow$  the firm will select the optimal level of capital by equating the marginal rate of technical substitution to the relative price

$$\frac{y_k}{y_{he}} = \frac{\rho}{w + m}$$

However, if capital affect the monitoring ability of the firm (for example modifying the monitoring capacity  $t = t(e, m, k)$ ), it is crucial to observe the sign of cross derivative

$$\frac{de}{dk} = \frac{t_{ek}}{u_{ee} - t_{ee}}$$

An increase in the ability of the firm to monitor the worker's effort increases the marginal return of the effort.

## The equilibrium transaction

In equilibrium the participation constraint does not bite, that is  $v^* > z$ . This implies that labour market does not clear  $\rightarrow$  equilibrium (involuntary) unemployment: workers unable to find a job are *quantity constrained*.

The resulting exchange  $(e^*, w^*)$  is Pareto inefficient. In fact at first order condition it must be that

$$v_e = 0 \text{ but } \pi_e > 0$$

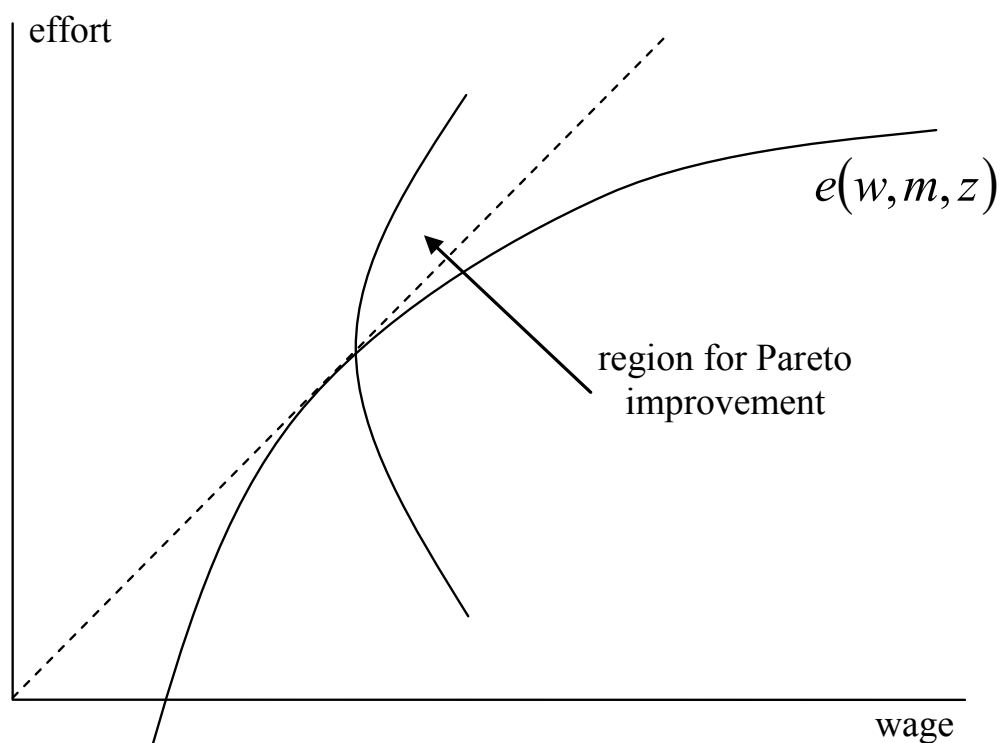
and also

$$v_w > 0 \text{ but } \pi_w = 0$$

Therefore there must exist (sufficiently small) variations  $(\Delta e, \Delta w)$  such that

$$\begin{aligned} v(e^* + \Delta e, w^* + \Delta w) &> v(e^*, w^*) \\ \pi(e^* + \Delta e, w^* + \Delta w, \dots) &> \pi(e^*, w^*) \end{aligned}$$

Also a small decrease in monitoring and a small increase in effort is also Pareto improving.



In competitive equilibrium, non-productive inputs are also hired. Surveillance workers do not increase output but profit maximising employer hires them. If this is not the case, set  $m = 0$ , then  $t_e = 0$  (additional effort is not recognised) and therefore  $e^* = \underline{e}$ .

The competitive equilibrium is technically inefficient. Consider the iso-effort locus

$$e(w^*, m^*, z) = e(w^* + \Delta w, m^* + \Delta m, z)$$

By reducing the monitoring resources, additional inputs could be used in production.

While monitoring and wage are costly to the employer, only monitoring is costly at social level. From a social efficiency standpoint, competitively determined labour discipline strategies generally overuse monitoring and underuse enforcement rents. “More carrot and less stick would affect a technically efficient improvement”.

Additional HR instruments may affect the employment relationship: if job amenities affect the worker utility and are costly to provide for the employer, they will be provided up to the point where the marginal cost of provision are equal to the marginal benefit in terms of effort-inducing impact (which will be Pareto-inferior with respect to other combinations).

### The general equilibrium

The number of firms is determined by the zero-profit condition

$$\pi = y(he(w, m, z)) - (w + m)h - \delta = 0$$

where  $\delta$  is the per-period cost of fixed inputs.  $w, m, e$  are optimally selected by previous first-order conditions. As labour is assumed to be identical everywhere, the expected wage in alternative employment  $w$  must be identical everywhere. Therefore the workers’ fallback position  $z$  must be affected by a cost of being terminated, which entails some spell of unemployment.

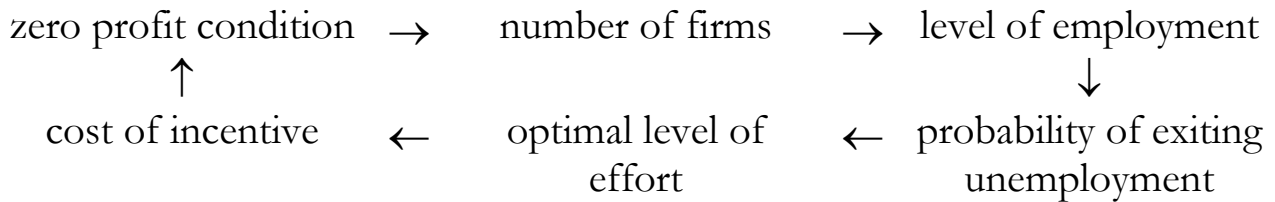


If  $b$  represents an unemployment subsidy and  $\lambda$  indicates the probability of exit from the unemployment pool, then

$$z = \frac{u(b,0) + \lambda v + (1 - \lambda)z}{1 + i} = \frac{u(b,0) + \lambda v}{\lambda + i}$$

An increase in the probability of exiting unemployment improves the fallback position, thus *ceteris paribus* reducing the optimal level of effort (or equivalently raising the cost of obtaining effort on the side of the firm).

Since the probability of employment depends on the aggregate level of employment, which is proportional to the number of firms, the model is therefore closed in the following way:



## BARGAINED PARETO IMPROVEMENT

Why Pareto improvement are not attained ? Because the agreements are not enforceable (effort is not contractible).

If the ownership were transferred to the workers (as self-employers or in a workers' cooperative), the workers would be residual claimant, and there would not be any need for monitoring.

Alternatively, if work could be organised as team-work, and workers could be organised in a workers' union, able to implement peer-monitoring, then higher level of effort could be exchanged with higher wages.

If no binding contract can be signed, still the employer and the union can implement Pareto-superior outcome by adopting strategies of conditional cooperation (nice tit-for-tat).

As in other cooperation/defect games, cooperation is sustained by lower intertemporal discount rates. In addition, if the termination probability also depends on the volatility of the external environment, and increase in macroeconomic fluctuations reduces the probability of cooperation.

Both cooperation and non cooperation are observed in the labour market, yielding a dual structure:

- ⇒ large firms with unionised labour force are more likely to implement the cooperative solution (long-term employment, well-defined promotion ladders, infrequent firing for cause, gain sharing)
- ⇒ secondary economy are more likely to implement the non-cooperative Pareto inferior labour discipline contracts (insecure employment, short job ladders, lower wage)

Reduced macroeconomic demand fluctuations and large unions jointly sustain Pareto-improvements (*institutional complementarities*).

## WHY DON'T FIRMS SELL JOBS ?

Could not a firm, noticing that the worker receives a substantial increase in the present value of expected lifetime utility when the job is secured, simply charge a fee for granting the job ?

The worker would be asked to pay a fee  $(v^* - z^*)$ , making him indifferent from taking a job or not (but not indifferent on losing it or not), the firm's profit would be higher, a greater number of employer would enter the market, and employment would achieve full employment.

The fee would be paid out from worker's wealth, thus making the worker poorer, but without changing the wage/effort combination.

Simplifying assumptions:

- \* exclude opportunistic behaviour on the side of the firm (firing workers without cause to cash the fee)
- \* neglect monitoring ( $e$  is known to the employer, but this information is non verifiable).

The employer solves the problem

$$\max_{h,w,B} \pi = y(he(w)) - hw + iBh$$

where  $B$  is the fee. The participation constraint for the worker requires

$$v(e(w), w - iB) \geq z$$

where  $(w - iB)$  is the net wage, taking into account of the opportunity cost to the employee of foregoing return  $iB$  on the employee's wealth.

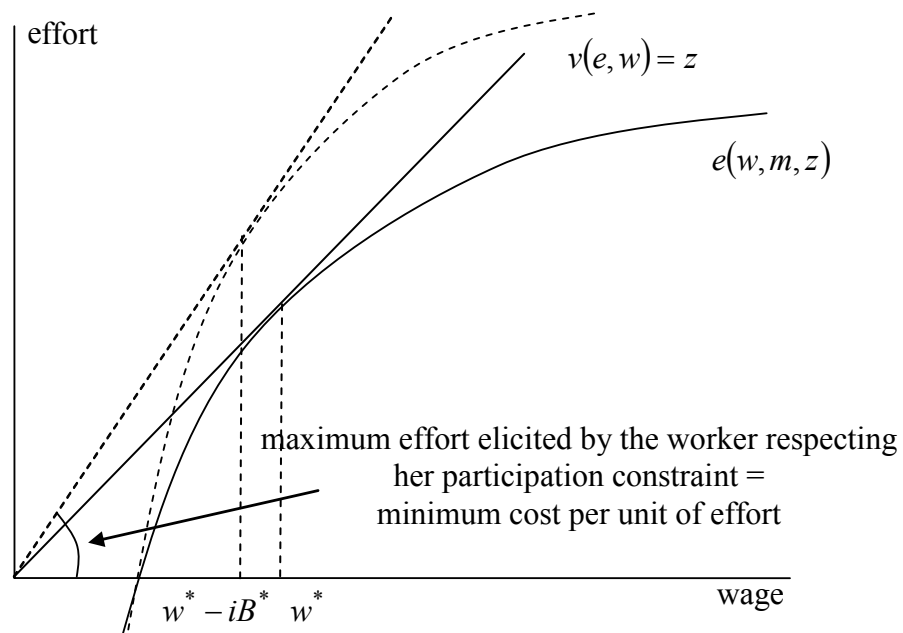
The first order conditions derived from the Lagrangian function yields

$$\pi_h = y'e - w + iB \quad \Leftrightarrow \quad y' = \frac{w - iB}{e}$$

⇒ the employment level is set in order to equate the marginal product of effort  $y'$  with the labour cost per unit of effort. By solving for other variables we also get

$$y' = -\frac{v_e}{v_w} = \frac{w - iB}{e}$$

⇒ the cost of a unit of effort to the firm must be equal to the marginal rate of substitution between wage and effort in the worker's indifference curve. In graphical terms



- ① the worker is indifferent between taking the job or not;
- ② the labour market clears;
- ③ the ex-ante rent is zero, but ex-post is higher than in the no-fee case (it partially incorporate the fee that has to be paid by the worker);
- ④ the wealth of the worker is reduced, and the profit of the firm is increased.

Why we do not observe job fees in the actual jobs (out of low-wage probation periods) ?

Possible answers:

⇒ firms prefer to keep up the morale of the workers (they do not cut wages in depression periods)

⇒ reciprocal preferences (gift exchange)

#### EMPRICAL EVIDENCE SUPPORTING LABOUR DISCIPLINE

1) employment rents are significant ( $(w - z) > 0$  can be observed in case of involuntary displaced workers – we should add the subjective cost of stigma associated to being unemployed)

2) real wages tend to vary with the employment level (contrary to the standard Walrasian prediction of a negative correlation)

3) employers devote significant resources to monitoring

4) work effort is assessed not for termination for cause (at least in Europe), but definitively for promotions.