$$\begin{cases} S_L - \dfrac{e_L^2}{2} = S_H - \dfrac{(e_H - \Delta\theta)^2}{2} & ICC_L \\[2ex] S_H - \dfrac{e_H^2}{2} = 0 & PC_H \end{cases}$$

REPLACING THE CONSTRAINTS INTO THE REGULATOR OBJECTIVE FUNCTION

$$\min_{e_L,\, e_H} \left\{ \beta \underbrace{\left(\overbrace{\frac{e_L^2}{2} - e_L}^{\text{SURPLUS}} + \overbrace{\left[\frac{e_H^2}{2} - \frac{(e_H - \Delta\theta)^2}{2} \right]}^{\text{RENT}} \right)}_{\text{L TYPE}} + \overbrace{(1-\beta)\left(\frac{e_H^2}{2} - e_H \right)}^{\text{H TYPE}} \right.$$

SOLVE $e_L^* = 1$

$$\text{MAX} \left\{ e_H^* = 1 - \frac{\beta}{1-\beta} \Delta\theta ,\ 0 \right\} < 1$$

UNDERPROVISION OF EFFORT

NON OBSERVABLE / HIDDEN ACTION

(MORAL HAZARD)

POST - CONTRACTUAL OPPORTUNISM

PRINCIPAL - AGENT RELATIONSHIP

MODEL (P - A)

AGENT WORKS FOR THE PRINCIPAL

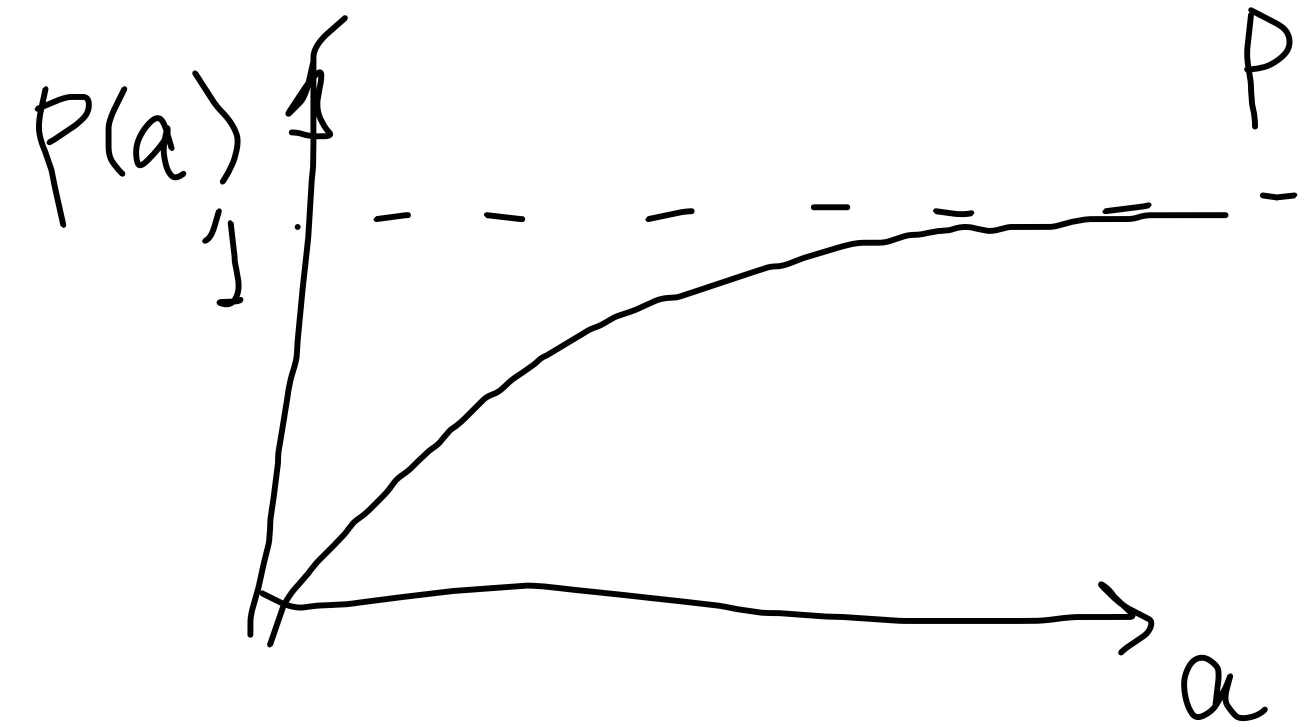
OUTCOME OF A'S WORK BELONGS TO P

OUTCOME IS A RANDOM VARIABLE

$q = \{0, 1\}$

BAD GOOD

FAILURE SUCCESS



EX

$$p(a) = \frac{a}{1+a}$$

$$p'(0) > 1$$

$$P[q = 1 \mid a] = p(a) \; ; \quad p'(a) > 0$$

$$p''(a) < 0$$

$$\lim_{a \to \infty} p(a) = 1$$

$$p(0) = 0$$

PRINCIPAL

$\underbrace{V(q-w)}_{\text{PROFITS}}$ WHERE w = SALARY — WAGE PAID TO THE AGENT

IF $V' > 0$, $V'' \leq 0$

AGENT

UTILITY FUNCTION $= U(w) - \psi(a)$ $\qquad U' > 0 \qquad \psi'(a) > 0$

$U'' < 0 \qquad \psi''(a) \geq 0$

FOR SIMPLICITY $\boxed{\psi(a) = a}$

SYMMETRY OF INFORMATION
OBSERVABLE ACTION
FIRST BEST CONTRACT

PROBLEM

$$\max_{\underbrace{a,\, w_a,\, w_I}_{\text{CONTRACT}}} \; p(a)\,V(1 - w_I) + (1 - p(a))\,V(\Theta - w_0)$$

SUCH THAT

$$\underbrace{p(a)\left[U(w_I) - \psi(a)\right] + (1 - p(a))\left[U(w_a) - \psi(a)\right] \geq 0}_{PC_A}$$

Using the Lagrangian

$$\begin{cases} (*)\quad FOC_{w_1}\quad -\cancel{p(a)}\,V'(1-w_1) + \lambda\,\cancel{p(a)}\,U'(w_1) = 0 \\ (**)\quad FOC_{w_a}\quad -\cancel{[1-p(a)]}\,V'(-w_a) + \lambda\,\cancel{[1-p(a)]}\,U'(w_a) = 0 \end{cases}$$

$$(*) \Rightarrow \lambda = \frac{V'(1-w_1)}{U'(w_1)}$$

$$\Longrightarrow \boxed{\frac{V'(1-w_1)}{U'(w_1)} = \frac{V'(-w_a)}{U'(w_a)}}$$

$$(**) \Rightarrow \lambda = \frac{V'(-w_a)}{U'(w_a)}$$

Consider

$V(x) = x$

$V(q-w) = q-w$

IF $V(x) = x \Longrightarrow \boxed{\dfrac{1}{U'(w_1)} = \dfrac{1}{U'(w_2)}}$

$\Longrightarrow \boxed{w_1 = w_2} \Rightarrow$ WITH OBSERVABILITY + LINEARITY OF P'S UTILITY FUNCTION (RISK NEUTRALITY) + RISK AVERSION OF THE AGENT ($U' > 0$, $U'' < 0$) $\longrightarrow$ AGENT IS COMPLETELY INSURED BY P

(NON-OBSERVABLE ACTION) ASYMMETRIC INFORMATION

SECOND BEST CONTRACT

$$\max_{a, w_1, w_0} p(a)V(1-w_1) + (1-p(a))V(-w_0)$$

SUCH THAT

$$\begin{cases} p(a)U(w_1) + (1-p(a))U(w_0) - a \geq 0 & PC_A \\ p'(a)[U(w_1) - U(w_0)] = 1 & ICC_A \end{cases}$$

FIRST ORDER APPROACH $\rightarrow \max_a [p(a)U(w_1) + (1-p(a))U(w_0) - a]$

$FOC_a \quad p'(a)U(w_1) - p'(a)U(w_0) - 1 = 0$

$$ICC_A \quad \overbrace{p(a)}^{+}\,\overbrace{\left[U(w_1) - U(w_0)\right]}^{} = \underset{+}{I}$$

MUST BE POSITIVE

$$\Downarrow$$

$$U(w_1) > U(w_0)$$

$$\Downarrow$$

$$\boxed{w_1 > w_0}$$ NO LONGER FULLY INSURED

PAYMENT OF A WILL BE RISKY

~~EXERCISE~~

$V(x) = x$

1) $U(w) = \log w$

2) $U(w) = w^a \quad 0 < a < 1$

FIND

$\Downarrow$ FIRST BEST

SECOND BEST

a_1, w_{a_1}, w_1