Efficient condition $(2)\ x_g - x_b = (1-\gamma_b)\pi_g$

Claim 1: When $\pi_b > p\pi_g$, then strikes cannot be efficient.

Proof

Consider a strike mechanism $\mu = (\gamma_g, x_g, \gamma_b, x_b) = (1, x_b + (1-\gamma_b)\pi_g, \gamma_b, x_b)$ which satisfies (2), with $\gamma_b < 1$.

We want to show that there is a mechanism μ^* more efficient then μ, where

$$\mu^* = (\gamma_g^*, x_g^*, \gamma_b^*, x_b^*)$$
$$\overset{(2)}{=} (1, x_b^* + (1-\gamma_b^*)\pi_g, \gamma_b + \delta, x_b + p\pi_g\delta),$$
$$= (1, (x_b + p\pi_g\delta) + (1-\gamma_b - \delta)\pi_g, \gamma_b + \delta, x_b + p\pi_g\delta)$$

δ is a small positive number.

Computing the informed bargainer's payoffs with μ and μ^*.

	Good	Bad
μ	$\gamma_g\pi_g - x_g = \pi_g - [x_b + (1-\gamma_b)\pi_g]$ $= \gamma_b\pi_g - x_b$	$\gamma_b\pi_b - x_b = \gamma_b\pi_b - x_b$
μ^*	$\gamma_g^*\pi_g - x_g^* = \pi_g - [(x_b + p\pi_g\delta) + (1-\gamma_b-\delta)\pi_g]$ $= \gamma_b\pi_g - x_b + \delta\pi_g - p\pi_g\delta$	$\gamma_b^*\pi_b - x_b^* = (\gamma_b + \delta)\pi_b - (x_b + p\pi_g\delta)$ $= \gamma_b\pi_b - x_b + \delta\pi_b - p\pi_g\delta$

The resulting changes in expected payoffs to the informed bargainer in the good states is

$$\Delta V_g = (\gamma_g^*\pi_g - x_g^*) - (\gamma_g\pi_g - x_g) = (\gamma_b\pi_g - x_b + \delta\pi_g - p\pi_g\delta) - (\gamma_b\pi_g - x_b) = \delta\pi_g - p\pi_g\delta > 0;$$

the resulting changes in expected payoffs to the informed bargainer in the bad states is

$$\Delta V_b = (\gamma_b^*\pi_b - x_b^*) - (\gamma_b\pi_b - x_b) = (\gamma_b\pi_b - x_b + \delta\pi_b - p\pi_g\delta) - (\gamma_b\pi_g - x_b) = \delta\pi_b - p\pi_g\delta > 0;$$

the resulting changes in expected payoffs to the uninformed bargainer is

$$\Delta U = [px_g^* + (1-p)x_b^*] - [px_g + (1-p)x_b]$$
$$= \{p[(x_b + p\pi_g\delta) + (1-\gamma_b-\delta)\pi_g] + (1-p)(x_b + p\pi_g\delta)\} - \{p[x_b + (1-\gamma_b)\pi_g] + (1-p)x_b\}$$
$$= \{p(1-\gamma_b-\delta)\pi_g + x_b + p\pi_g\delta\} - \{p(1-\gamma_b)\pi_g + x_b\}$$
$$= -p\pi_g\delta + p\pi_g\delta = 0.$$

So μ^* is more efficient then μ; i. e. , strikes cannot be efficient.

Claim 2: When $\pi_b < p\pi_g$, then least one efficient strike mechanism exists.

Proof

Consider a strike mechanism $\mu = (\gamma_g, x_g, \gamma_b, x_b) = (1, \pi_g, 0, 0)$.

Assume a mechanism $\mu^* = (\gamma_g^*, x_g^*, \gamma_b^*, x_b^*) \overset{(2)}{=} (1, d + (1-\delta)\pi_g, \delta, d)$ is strictly

dominates μ. So we get

$$p(1-\delta)\pi_g + d = p[d + (1-\delta)] + (1-p)d = px_g^* + (1-p)x_b^* \geq px_g + (1-p)x_b = p\pi_g \cdots (1)$$

$$\Rightarrow 0 \overset{(1)}{\geq} p\pi_g - p(1-\delta)\pi_g - d = p\delta\pi_g - d \overset{\pi_b < p\pi_g}{>} \delta\pi_b - d = \gamma_b^*\pi_b - x_b^* \geq \gamma_b\pi_b - x_b = 0$$

an contradiction.

Claim 3: When $\pi_b > p\pi_g$, then $\mu^* = (\gamma_g, x_g, \gamma_b, x_b) = (1, \pi_b, 1, \pi_b)$ is the best

mechanism for uninformed bargainer.

Proof

$$\mu = (\gamma_g, x_g, \gamma_b, x_b) \overset{\text{Claim 1}}{=} (1, x_b, 1, x_b)$$
$$\max\{px_g + (1-p)x_b\} = \max\{x_b\} = \pi_b$$

Claim 4: When $\pi_b < p\pi_g$, then $\mu^* = (\gamma_g, x_g, \gamma_b, x_b) = (1, \pi_g, 0, 0)$ is the best

mechanism for uninformed bargainer.

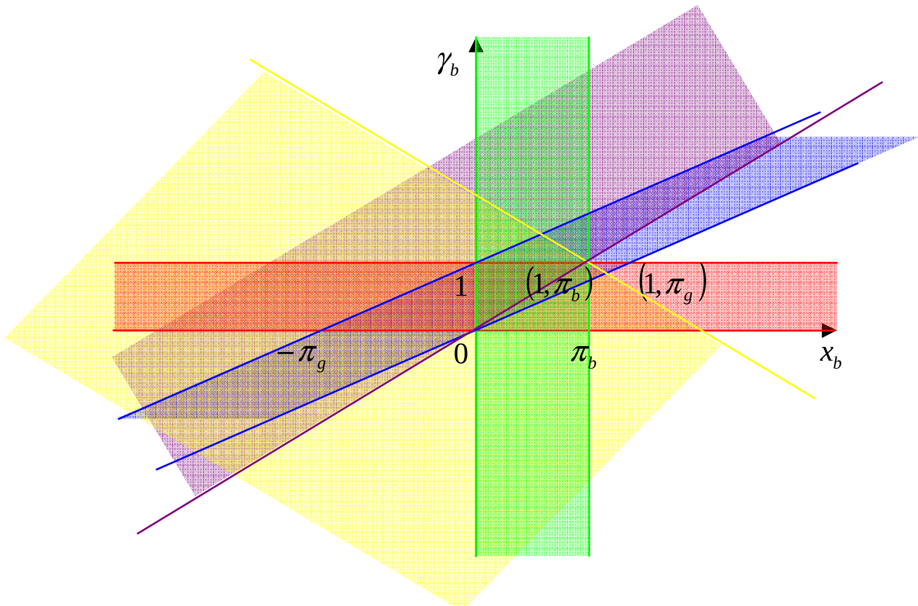
Proof

$\mu = (\gamma_g, x_g, \gamma_b, x_b) = (1, x_b + (1-\gamma_b)\pi_g, \gamma_b, x_b)$, where

$0 \leq \gamma_b \leq 1$, $0 \leq x_b \leq \pi_b$, $0 \leq x_b + (1-\gamma_b)\pi_g \leq \pi_g$,

$(IR)_g : 0 \leq \gamma_g\pi_g - x_g = \pi_g - x_b + (1-\gamma_b)\pi_g = 2\pi_g - x_b - \pi_g\gamma_b$, $(IR)_b : 0 \leq \gamma_b\pi_b - x_b$

The possible region is



So the vertex of the possible region is $\{(1,\pi_g,0,0),(1,0,1,0),(1,\pi_b,1,\pi_b)\}$.

The target function

$u_u(\mu) = px_g + (1-p)x_b = p[x_b + (1-\gamma_b)\pi_g] + (1-p)x_b = x_b + p(1-\gamma_b)\pi_g$.

So $u_u(1,\pi_g,0,0) = p\pi_g, u_u(1,0,1,0) = 0, u_u(1,\pi_b,1,\pi_b) = \pi_b$

Claim 5: When $\mu^* = (\gamma_g, x_g, \gamma_b, x_b) = (1,0,1,0)$ is the best mechanism for informed bargainer.

Proof

Assume $\mu = (\gamma_g, x_g, \gamma_b, x_b)$.

When the true state is good, $\max\{\gamma_g \pi_g - x_g\} = \pi_g$, where $\gamma_g = 1, x_g = 0$;

When the true state is bad, $\max\{\gamma_b \pi_b - x_b\} = \pi_b$, where $\gamma_b = 1, x_b = 0$.

So in whatever situation, μ^* is the best mechanism.