# Empowerment And Efficiency: Tenancy Reform in West Bengal.

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# Introduction.

- The authors analyze the impact of tenancy reforms on farm productivity.

- Tenancy reforms here refers to the following things:
  - ✓ Providing security of tenure to the farmer.
  - ✓ Regulating the share of output paid as rent.

- The effect of tenancy reforms is broken into two parts;
  - ✓ Bargaining power effect.
  - ✓ Security of tenure effect.

- The evidence on tenancy reforms in West bengal suggests that there are positive effects of tenancy reforms on land productivity.

# Operation Barga

- After Independence India sought to improve the living standards of the sharecroppers through tenancy reforms. This was done through the Land Reforms Act of 1955.

- This Act and its subsequent amendments had two major clauses:
  - ✓ The tenants will have permanent and inheritable incumbency rights, subject to some conditions.
  - ✓ The share the landlord can demand cannot exceed 25 percent.

- This Act had flaws, it could be exploited to ensure eviction threats.The tenants were responsible to register themselves, but the government provided little institutional support.

- By virtue of their wealth and superior caste the landlord was able to intimidate the tenants. The government most often took the landlord's side in cases of dispute. As a result very little sharecroppers were registered.

- Operation Barga was undertaken in 1977 by the newly elected government to ensure the laws were succesfully implemented and ensured that the tenant's were safe from the landlords.
- There is widespread support for reforming the agricultural property rights, but there have been very few studies on the consequences of such programs.
- The bargaining power effect has impact along the following lines; The legal contract becomes the tenant's outside option. This induces the lanlord to provide higher crop shares translating into higher incentives.
- Security of tenure has two opposing impacts;
  - ✓ The loss of threat of eviction is a loss on the incentive to work hard.
  - ✓ The permanancy allows for higher incentive to invest in the land by the tenant.

# Results

- As the outside option of the tenant increases, his effort level increases. This follows from the fact that the landlord pays them more as their outside option increases.
- The tenants participation constraint does not bind in case his outside option is very low. Thus he earns rent.
- The threat to eviction works as long as the tenant earns rents. In case the tenant earns rent, effort level is higher in presence of threats of eviction as compared to without it.

# Model

- The authors try to model a Landlord farmer relationship based on *moral hazard* and *limited liability constraints* of the tenants.
- Based on the arguments before regarding the increased bargaining power and security of tenure the model tries to analyse the impact of land reform.
- The two channels are as follows;
  - ✓ The actual contract could be modified because of the increase in the outside options of the farmer.
  - ✓ The security of tenure could change things as the threat of eviction is longer credible anymore

- There is an infinitely lived landlord who owns a plot of land but cannot crop himself. In each period he employs exactly one tenant.

- There is a large population of identical infinitely lived agents who are ready to work for the landlord as long as they are paid their outside option $m$. They have a wealth level of $w$.

- Both the tenant and the landlord face the same discount factor of $\delta$.

- There are two possible outcomes:

$$outcome = \begin{cases} 1 & \text{High or Success} \quad \text{With probability} \quad e. \\ 0 & \text{Low or Failure} \quad \text{With probability} \quad 1 - e. \end{cases}$$

- The tenant chooses the effort level $e$. His cost of effort being $c(e) = \frac{1}{2}ce^2$. Assume $c \geq 1$.

# Assumptions

- ✓ Only the tenant's effort matters for the output.
- ✓ The tenant's effort is unobservable and hence uncontractable.
- ✓ Past and present realizations of output are contractible. That is depending on past and current realisations of output the landlord decides upon -
  - Current payment to each potential tenant.
  - Decision regarding which tenant is going to work for him in the next period.
- ✓ The tenant faces a limited liability constraint.
- ✓ Both tenant and the landlord are risk-neutral.

- This presents an infinite extensive-form game between the landlord and the tenant.The focus is on the history independent strategies in each period.

- The authors concentrate on maximising the landlord's profit in each period.(note:there are many potential tenants and one landlord.)

- In this game, there is no need to pay those who are currently not employed and no reason for discrimination between those agents who are not working for him right now.

- Contract of each tenant will just depend on the current realization of output. The contract specifies four numbers, i.e; Payment to the tenant and his probability of retaining the job based on output-

  $(h$ & $\varphi)$ if High & $(l$ & $\psi)$ if Low.

# Optimal Tenancy Contracts without Eviction.

✓ Given that the tenant can't be evicted from the farm, it boils down to solving the one period contracting problem.

✓ Outside option being $m$ and the wealth level of the tenants being $w$ the optimal contract is solving the following problem;

$$\max_{(e,h,l)} \quad \pi = e - [eh + (1-e)l]$$

Subject to;

- $h \geq -(1+w), \qquad l \geq -w \ldots$ (LLC).
- $v = eh + (1-e)l - \frac{1}{2}ce^2 \geq m \ldots$ (PC).
- $e = arg \max_{e \in [0,1]} \left\{ eh + (1-e)l - \frac{1}{2}ce^2 \right\}, e \in [0,1] \ldots$ (ICC)

Consider the following things about the optimal contract$(h, l)$;

- $h \geq l$, otherwise if $l \geq h$ then from the ICC we have $e = 0$. Also under this condition as we can see the Landlord gets $-l$.

From the ICC we have $e = \frac{h-l}{c}$, if $h < l$ then $e = 0$.

- Even for the same $l$, if he sets $1 \geq h \geq l$ then

$$e[1 - (h - l)] \geq -l$$

Also follows from above that one of the two constraints, $h \geq -(1 + w)$ can't bind.

We know $h \geq l$ & $l \geq -w$
$\Rightarrow h \geq l \geq -w \geq -(1 + w)$.

# The First Best Solution.

- The total surplus generated by any project is given by the following:
$$S = e - (ce^2/2)$$
- The level of effort that maximises Total surplus is $1/c < 1$ following from the assumptions made before.
- As it appears the constraint $e \leq 1$ does not bind at the first best solution, it becomes redundant.
- There appears no reason to choose $h - l > 1$. The first best level of effort is chosen when $h - l = 1$. And the ICC can be rewritten as

$$e = \frac{h - l}{c} \in (0, 1)$$

# Optimisation Problem Redefined.

Continuing from before, we can substitute the effort level from before, the optimal contracting problem of the landlord can be rewritten as ;

$$\max_{[h,l]} \quad \pi(h,l) = \frac{h-l}{c} - \frac{(h-l)^2}{c} - l$$

subject to:

$$\frac{(h-l)^2}{2c} + l \geq m$$

and

$$l \geq -w$$

# Solution

- We first consider the solution when the participation constraints do not hold. In this case it is optimal to reduce the liability constraint to ensure it binds, i.e; $l = -w$ while keeping $h - l$ unchanged.
- The profit maximisation subject to $h - l$ results in the following;

$$h^* - l^* = 1/2, e^* = 1/2c$$

- Plugging them into the participation constraint yields

$$1/8c \geq m + w$$

The participation constraint does not bind as long as $m\&w$ are low enough and in this case the optimal effort level is $e^* = 1/2c$.

- Now consider the case where $1/8c < m + w$. In this case the participation constraint binds, substituting the value of $l$ from the participation constraint into the expression of $\pi$ gives us

$$\pi(h, l) = \frac{h - l}{c} - \frac{(h - l)^2}{2c} - m$$

  This expression is maximised when we $h - l = 1$. This is a full rental contract that pays the landlord w in all state of the world.
- This yields, $e = 1/c$. Along with the fact that $h - l = 1$, we can ensure from the participation constraint that $l = m - (1/2c)$.
- The LLC requires $l \geq -w$, this means that $m + w \geq 1/(2c)$ otherwise the LLC binds.
  In this range the first best solution holds.

We have derived the effort levels for the two extreme ranges, let us consider the intermediate range, i.e;

$$\frac{1}{8c} \leq m + w < \frac{1}{2c}$$

In this range both the participation and the liability constraints bind.
This gives us,

$$l = -w \quad \& \quad h - l = \sqrt{2c(m+w)}$$

$$\Rightarrow e^* = \sqrt{\frac{2(m+w)}{c}}$$

# Optimisation-Kuhn Tucker.

$$\max_{[h,l]} \quad \pi(h,l) = \frac{h-l}{c} - \frac{(h-l)^2}{c} - l$$

subject to:

$$\frac{(h-l)^2}{2c} + l \geq m$$

and

$$l \geq -w$$

# First order conditions

## Lagrangian

$$\chi = \frac{h-l}{c} - \frac{(h-l)^2}{c} - l + \lambda[\frac{(h-l)^2}{2c} + l - m] + \mu[l + w]$$

## FOC

- h: $1/c - \frac{2(h-l)}{c} + \frac{\lambda(h-l)}{c} = 0 \ldots (1)$
- l: $-1/c + \frac{2(h-l)}{c} - 1 - \frac{\lambda(h-l)}{c} + \lambda + \mu = 0 \ldots (2)$
- $\lambda$: $\lambda[\frac{(h-l)^2}{2c} + -m] = 0; \quad \lambda \geq 0; \quad \frac{(h-l)^2}{2c} + -m \geq 0 \ldots (3)$
- $\mu$ : $\mu[l + w] = 0; \quad \mu \geq 0; \quad l + w \geq 0 \ldots (4)$

CASE-1: None of the constraints bind.

We have $\lambda = 0$; $\mu = 0$.Using these in (2) we have;

$$-1/c + \frac{2(h-l)}{c} - 1 = 0$$

$$\Rightarrow -1 + 2(h-l) - c = 0$$

$$\Rightarrow h - l = \frac{c+1}{2} \geq 1$$

*None of the constraints binding is not a feasible option*

CASE-2: LLC binds and PC does not bind.

We have $\lambda = 0$ and $\mu \geq 0$. Using this in (1) we have;

$\Rightarrow 1/c - \frac{1}{c} - \frac{2(h-l)}{c} = 0$

$\Rightarrow h - l = 1/2.$

Now using (3);

$$m + w \leq \frac{1}{8c}$$

*Tenant's with low outside option earn rents.*

CASE-3: LLC binds and PC does not bind.

We have$\lambda \geq 0$ and $\mu = 0$ . Using this in (1) and (2) we have;

$\lambda = 1$

$\Rightarrow \frac{1}{c} - \frac{2(h-l)}{c} + \frac{h-l}{c} = 0$

$\Rightarrow 1 - 2(h-l) + (h-l) = 0 \Rightarrow h - l = 1$

Now using (3) & (4);

$l \geq -w$ and

$\Rightarrow l = m + \frac{(h-l)^2}{2c}$

$\Rightarrow m + w \geq \frac{1}{2c}$

CASE-4:Both PC & LLC bind.

We have$\lambda \geq 0$ and $\mu \geq 0$ . Using this in (3); $h - l = \sqrt{2c(m+w)}$

And from (1) we have;

$\lambda = 2 - \frac{1}{h-l}$

Using the above results in (2) we have;

$-1 + \frac{1}{h-l} = \mu \geq 0$

Using value of $(h - l)$ derived above we have;

$m + w \leq \frac{1}{2c}$

As $\lambda \geq 0$ from the value of $\lambda$ derived above;

$2 - \frac{1}{h-l} \geq 0$

$\Rightarrow m + w \geq 1/(8c)$

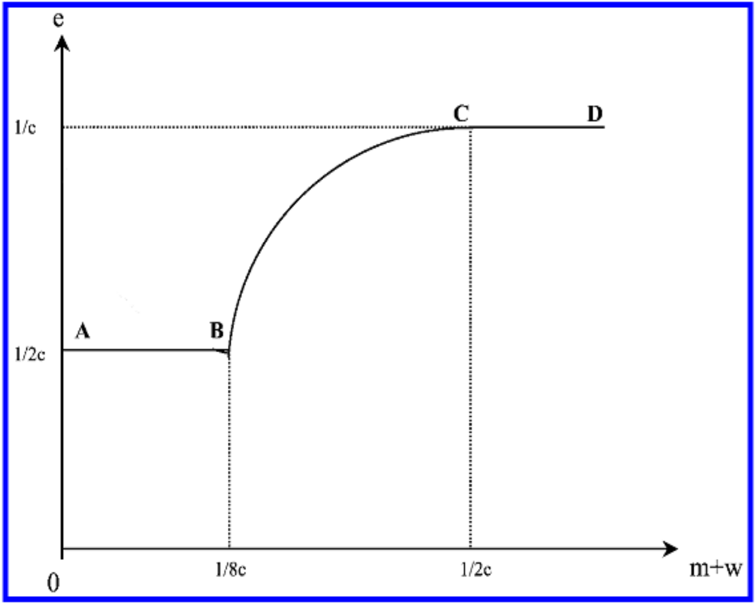
# Results.

The effort determined by the optimal contract for the different ranges have been pinned down, they are;

$$e^* = \begin{cases} \frac{1}{2c} & \text{if} \quad m + w < \frac{1}{8c} \\ \sqrt{\frac{2(m+w)}{c}} & \text{if} \quad \frac{1}{8c} \leq m + w < \frac{1}{2c} \\ \frac{1}{c} & \text{if} \quad m + w \geq \frac{1}{2c} \end{cases}$$

*An improvement in the tenant's outside option always increases his effort level.*

# Diagram



*As long as the tenant's participation constraint does not bind he earns rents. i.e; when*

$$m + w < \frac{1}{8c}$$

The intuition behind these results are;

- The main trade-off the landlord faces are between extracting the surplus and providing incentives.
- The fixed rent contract is always favoured by the wealthy tenant. But, this is not in favour of the landlord in case the tenant is poor, because of his limited liabilities.
- The landlord always favours contracts that allow him to extract more when there are higher outputs. But, this cuts down on incentives. As the tenant gets wealthier the incentive decrease is reduced.

- The increase in outside option forces the landlord to pay the tenant more. This is the basis of the *bargaining power* argument. The increase in the bargaining power of the tenant leads to higher shares and higher productivity.

- The outside option being very small, ensures that the landlord gives the tenant some incentive to work and this is the basis of the rent earned by the tenant. Otherwise if the entire rent is extracted in case of good output there are adverse effects on output.

# Optimal Tenancy Contracts with Eviction.

- In this case of allowing for eviction the landlord can do better than allowing for a one-shot contract.
- In the case of no eviction it was seen that under situations of low outside options the tenant used to earn rent.
- This earning of rent is the reason because of which the eviction from tenancy can be used as threat to the poor tenants to ensure high efforts at no additional cost. It works as an incentive mechanism.

# Model

Some notations;

- $\overline{V}$: The expected equilibrium lifetime utility of an incumbent tenant in the next period.

- M: Expected lifetime utility of someone who is not a tenant currently. $M \equiv \frac{m}{1-\delta}$

- The lifetime utility in the current period is:
  $V_0$: $\max_{e \in [0,1]} eh + \delta[\varphi e + (1-e)\psi](\overline{V} - M) + \delta M + (1-e)l - \frac{1}{2}ce^2$

- In optimal dyanmic contract $\varphi = 1$ and $\psi = 0$.This gives incentives to the tenant to work hard, at no extra cost to the landlord.

# Bellman's Equation

$$\overline{V_0} = \max_{e \in [0,1]} eh + (\delta e)(\overline{V} - M) + \delta M + (1-e)l - \frac{1}{2}ce^2 \ldots (1)$$

Differentiating with respect to $e$ gives;

$$h - l + \delta(\overline{V} - M) = ce \ldots (3)$$

In stationary equilibrium $\overline{V_0} = \overline{V}$. Using the Bellman's equation gives;

$$\overline{V} - M = \frac{eh + (1-e)l - \frac{1}{2}ce^2 - m}{1 - \delta e} \ldots (4)$$

Using (3) into (4) gives;

$$\overline{V} - M = \frac{1}{2}ce^2 + l - m \ldots (5)$$

# Optimisation Excercise.

In all equilibriums where eviction threats are used, $\overline{V} - M$ must be positive. The landlord maximises;

$$\max_{[e,h,l]} e(1-h) - (1-e)l$$

Subject to :

$h + w + \delta(\overline{V} - M) = ce \quad \ldots(a)(\text{ICC})$

$\overline{V} - M = 1/2(ce^2) + l - m \geq 0 \quad \ldots(b)(\text{PCC})$

$l \geq -w \ldots(c)(\text{LCC})$

# Revised problem.

Using the ICC in the objective function and the PCC we can write out the lagrangian for the optimisation excercise as follows;

$$\varpi = \frac{(h-l)+\delta(\overline{V}-M)}{c}[1-(h-l)]-l+\lambda[\frac{[(h-l)+\delta(\overline{V}-M)]^2}{2c}+l-m]+\mu[l+w]$$

The first order conditions will be as follows;

h: $\frac{1}{c}[1-(h-l)] - \frac{h-l+\delta(\overline{V}-M)}{c} + \frac{\lambda}{c}[(h-l)+\delta(\overline{V}-M)] = 0 \ldots (1)$

l: $-\frac{1}{c}[1-(h-l)] + \frac{h-l+\delta(\overline{V}-M)}{c} - \frac{\lambda}{c}[(h-l)+\delta(\overline{V}-M)] - 1 + \lambda + \mu = 0 \ldots (2)$

$\lambda$: $\lambda[\frac{[(h-l)+\delta(\overline{V}-M)]^2}{2c} + l - m] = 0; \quad \frac{[(h-l)+\delta(\overline{V}-M)]^2}{2c} + l - m \geq 0; \quad \lambda \geq 0 \ldots (3)$

$\mu$: $\mu[l+w] = 0; \quad [l+w] \geq 0; \quad \mu \geq 0 \ldots (4)$

# CASE-1

Let none of the constraints bind; $\lambda = 0$; $\mu = 0$

Adding (1) and (2) gives;

$$\lambda + \mu = 1$$

This contradicts the assumption. Hence this solution is not possible.

# CASE-2

Let LLC bind and PC does not bind; $\lambda = 0$; $\mu = 1$

Using above values in (1) we have;

$h - l = \frac{1-\delta(\overline{V}-M)}{2c}$

Using ICC we have:

$e = \frac{1+\delta(\overline{V}-M)}{2c}$

As Participation constraint does not bind we have $\overline{v} \geq M$; hence

$e \geq 1/(2c)$ and

$\overline{V} - M = \frac{1}{2}ce^2 + l - m$

$\Rightarrow \frac{1}{8c} - m - w \geq 0$

$\Rightarrow m + w \leq \frac{1}{8c}$

# CASE-3

Let LLC does not bind and PC binds; $\lambda = 1$; $\mu = 0$

From (1) we have;

$h - l = 1$

From the ICC we have;

$e = 1/c$

As the PC binds and LLC does'nt bind we have;
$l = m - \frac{1}{2}ce^2 + m$ and $l \geq -w$

$\Rightarrow m + w \geq \frac{1}{2c}$

# CASE-4

Let LLC & PC binds; $\lambda \geq 0$; $\mu \geq 0$

Solving (3) and (4) we have;

$e = \sqrt{\frac{2(m+w)}{c}}$

Using values above in (1) we derive value of $\lambda$ and using $\lambda \geq 0$;

$\lambda = 2 - \frac{1}{h-l}$

$\Rightarrow h - l \geq \frac{1}{2}$

Using the ICC

$e = \frac{h-l}{c} \geq \frac{1}{2c}$

Now using the PC which binds we have; $m + w = \frac{ce^2}{2}$

$\Rightarrow m + w = \frac{ce^2}{2} \geq \frac{1}{8c}$

# CASE-4

Now using the value $\lambda$ we calculate $\mu$;

$$\mu = 1 - 2 + \frac{1}{h-l} = \frac{1}{h-l} - 1$$

As $\mu \geq 0$;

$$\Rightarrow h - l \leq 1$$

Using ICC we can write; $e \leq 1/c$ As PC binds we can say;

$$m + w = \frac{ce^2}{2}$$

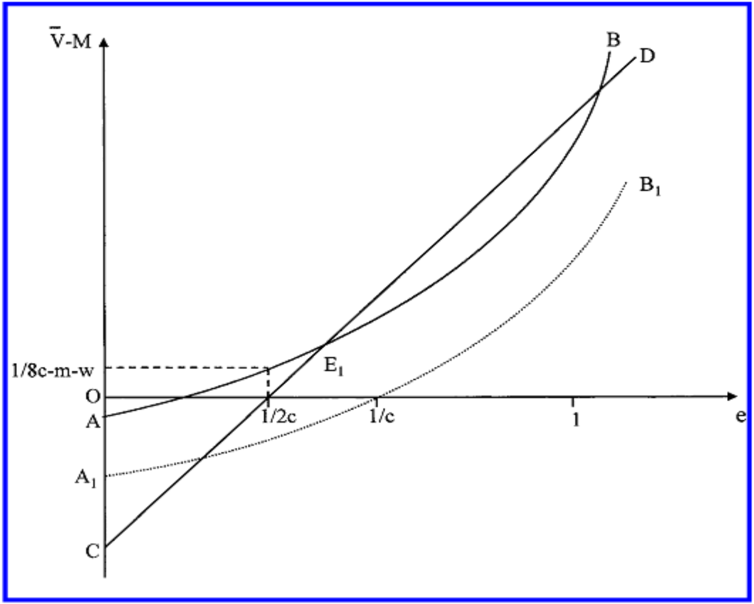
$$\Rightarrow m + w = \frac{ce^2}{2} \leq \frac{1}{2c}$$

# Results

The effort determined by the optimal contract for the different ranges have been pinned down, they are;

$$e^* = \begin{cases} \geq \frac{1}{2c} & \text{if} \quad m + w < \frac{1}{8c} \\ \sqrt{\frac{2(m+w)}{c}} & \text{if} \quad \frac{1}{8c} \leq m + w < \frac{1}{2c} \\ \frac{1}{c} & \text{if} \quad m + w \geq \frac{1}{2c} \end{cases}$$

# Diagram



- ✓ As $m + w$ increases(but with $1/(8c) - m - w > 0$ continuing to hold), The curve AB shifts down, hence the equilibrium values of effort also goes down.
- ✓ This is intuitive: As the rents and hence the force of the threat of eviction goes down with $m + w$ increasing the effort level should also decrease.
- ✓ Considering (3) & (7):

$$2\left\{h + w + \delta(\overline{V} - M)\right\} = 1 - \delta(\overline{V} - M)$$

$$\Rightarrow 2(h + w) = 1 - \delta(\overline{V} - M)$$

$$\Rightarrow h^* - l^* = \frac{1}{2} - \frac{\delta}{2}(\overline{V} - M)$$

*As* $(\overline{V} - M)$ *goes down when* $(m + w)$ *goes up* $(h^* - l^*)$ *must go up.*

For the case of $1/(8c) - m - w < 0$:

- This can be represented by moving the curve AB to $A_1 B_1$.It is clear from the graph itself that none of the two intersections are admissible.
- Solving the participation constraint equation(5) we get;

$$e^* = \sqrt{2(m+w)/c}$$

and

$$h^* = 1/2$$

.

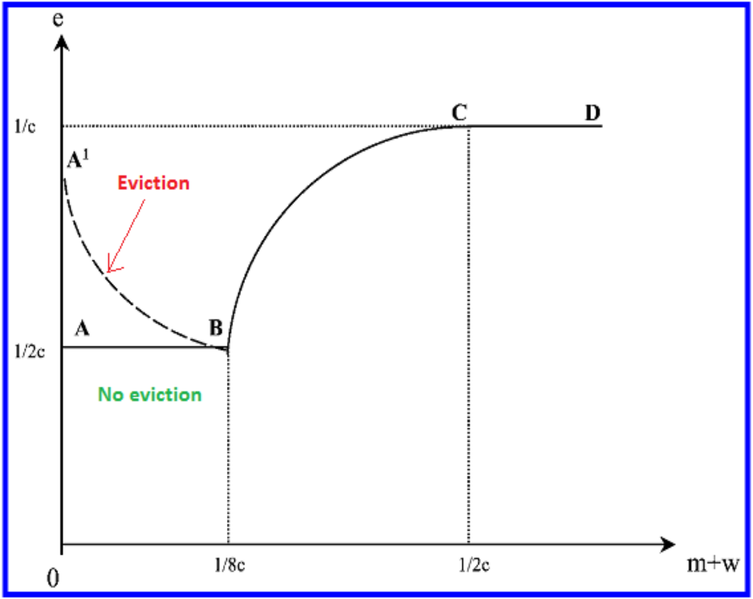
- This is exactly the value of $e^*$ we found in case when eviction was not an option, in the case of $1/(2c) \geq m + w \geq 1/(8c)$.

*This is expected: when the participation constraint binds, the fact that eviction is an option should be irrelevant.*

- The rule $e^* = \sqrt{2(m+w)/c}$ applies as long as $e^* \leq 1/c$, This is same as saying $m + w \leq 1/(2c)$.

- Otherwise effort is set at its first best level, that is $e^* = 1/c, \quad h^* - l^* = 1$. In this case the LLC will no longer bind.

- This is also similar to the case of the no-eviction threats.


e
1/c
C
D
A1
Eviction
A
B
1/2c
No eviction
0
1/8c
1/2c
m+w

# Results

When evicting the tenant is an option:

- ✓ The optimal choice of $e$ and $h - l$ coincides with that for the no-eviction case as long as $m + w \geq 1/(8c)$.
- ✓ For $m + w < 1/(8c)$, the value of e chosen is strictly higher than the corresponding value without evictions.
- ✓ Over this range, a higher $m$ is associated with a lower choice of $e$ but a higher value of $h - l$.

*This shows how the effects of operation barga could be negative in spite of the barfaining power effect described earlier. Eviction threats will tend to raise the effort level of very poor tenants, and unless the increase in m is large enough, their effort will fall as a result of the reform, though these tenants will still be better off.*

THANK YOU