Banerjee, Gertler, Ghatak (BGG)
On

Empowerment and Efficiency: Tenancy Reform in West Bengal

- ***Summary:*** An analyses of the effect of agricultural tenancy laws that offer security of tenure to tenants and regulate the share of output paid as rent on farm productivity.

Theoretically, the net impact of tenancy reform is shown to be a combination of two effects: a bargaining power effect and a security of tenure effect

The Big Picture

(before the math kicks in!)

- A brief note on the tenancy reform activities in Bengal ('55 & '77)
- There are few examples of large scale changes in property rights that were not accompanied by major social unrest.
- Operation Barga gave an opportunity to evaluate limited transfer of property rights as opposed to full transfer.
- And to examine relationship(s) between property rights and efficiency and trade-offs with equity.
- Following Operation Barga, there occurred noticeable improvements in tenants' contracts.
- Two effects: The bargaining power effect & the Security of tenure effect.
- There is empirical support for the hypothesis that the transfer of property rights under Operation Barga positively affected productivity.

- These results suggest that limited interventions in property rights like Operation Barga, can have a positive effect on productivity.
- Hence there is no necessary trade-off between efficiency and equity.
- Moreover, these strategies of empowerment tend to be politically easier to implement than conventional land reforms.
- They may therefore offer a real way out of the status quo in the right context.
- Next we look at theoretical arguments about how Operation Barga is likely to have affected contracts and incentives.

Theory: Tenancy reform, Contractual Changes and Productivity

- A simple theoretical model of a landlord – tenant relationship based on moral hazard and limited wealth of tenants.
- Analyze the potential effects of the reform on the contractual relationship between a given landlord and an incumbent tenant.
- Changes in potential contracts between the landlord and the tenant.
- First, it changed an incumbent tenant's outside option:

  That the landlord could no longer evict the tenant meant that the tenant could always hold out for his legal share.

  The landlord could no longer threaten to replace him with another tenant if he refused to accept a lower share.
- Secondly, a potential effect of the reform is related to restrictions on eviction.

  Under the new law, the tenant has no fear of eviction.

  And, the landlord could no longer expect to use the threat of eviction as a credible incentive device.
- The optimal contract could change for both these reasons.

The Model

Assumptions:

- An infinitely lived landlord owns a plot of land that he cannot crop himself.
- In each period he employs exactly one tenant to crop the land.
- There exists a large population of *identical infinitely lived (i.i.l)* tenants.
- They'll work, if paid their *exogenously given* outside option (or reservation payoff), ***m****, that period.*
- *The landlord and* the tenants share the same discount factor **δ**.
- In each period, output can take on two values, $Y_p = 1$ *("high" or "success")* & $Y_p = 0$ *("low" or failure)*
- Probability of the occurrence of each state is **e** *and* **1- e**, *respectively.*
- *The realizations* of output are independent over time.

- The tenant chooses ***e*** *("effort"),* which costs him ***c(e)***.

(A) $c(e) = \frac{1}{2}ce^2$

- We assume quadratic costs for simplicity.
- *Assume* ***c>1.***
- Only the tenant's effort matters for output.
- The tenant's effort choice *e is non-observable* and hence non-contractible.
- Past and present realizations of output are contractible.
- At the beginning of each period the landlord can commit himself to a one-period contract that maps current and past realizations of output into

  (*a) current payments* to each potential tenant

  (*b) a decision about which tenant* will work for him in the next period.
- The landlord faces a limited liability constraint: in a given period, each tenant has a limited amount of wealth ***w>0****, so that the least he can get paid is* ***-w.***

- Both the tenant and the landlord are risk-neutral.
- Infinitely lived individuals engage in an infinite extensive form game.
- We look at a restricted set of the possible multiple equilibria.
- Formally, we look at Markov equilibria where the state variable is the identity of the current tenant.
- We focus on the equilibrium that maximizes the *landlord's* profits per period.
- Contract specifies payments to current tenants.
- The landlord does not discriminate among those who are not working for him now.
- He can randomly pick a new tenant from the tenant pool.
- By assumption of history independence, the contract for each tenant changes only with current realizations of output.
- The contract specifies four numbers:

a) ***h****:* payment to tenant for **Y=1**

b) ***l****: payment to tenant for* ***Y=0***

c) ***1-φ****: probability of eviction for* ***Y=1.***

d) ***1-ψ****: probability of eviction for* ***Y=0****.*

- Akin to a linear contract: ***s*Y-r,*** *s* being output shares and *r* being the fixed rent component; ***(s=h-l)and (l=-r)*** (show this!)
- Output takes only two values, so all contracts can be expressed as linear contracts.

Optimal tenancy contracts without eviction.

- Tenants will continue tenancy in all future periods.
- The problem's equivalent to the one-period contract.
- Given the tenant's outside option ***m*** *and wealth* ***w****, the optimal contract is a solution of maximizing* the landlord's expected payoff, i.e.

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

The constraints:

a) The Limited liability Constraint: the amount of money that can be extracted is bounded above by wealth and realized output. **h** is at least as large as **l** or **e=0**. So, treat the first part of the constraint as redundant.

$$h \geq -(1 + w), \quad l \geq -w.$$

b) The Participation Constraint: contract guarantees an expected payoff of at least m.

$$v = eh + (1 - e)l - \tfrac{1}{2}ce^2 \geq m.$$

c) The incentive Compatibility Constraint: Choice of effort level e by the tenant.

$$e = \arg\max_{e \in [0,1]} \{eh + (1 - e)l - \tfrac{1}{2}ce^2\}.$$

Therefore,

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

RESULT 1. The value of e implied by the optimal contract between the landlord and the tenant is

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

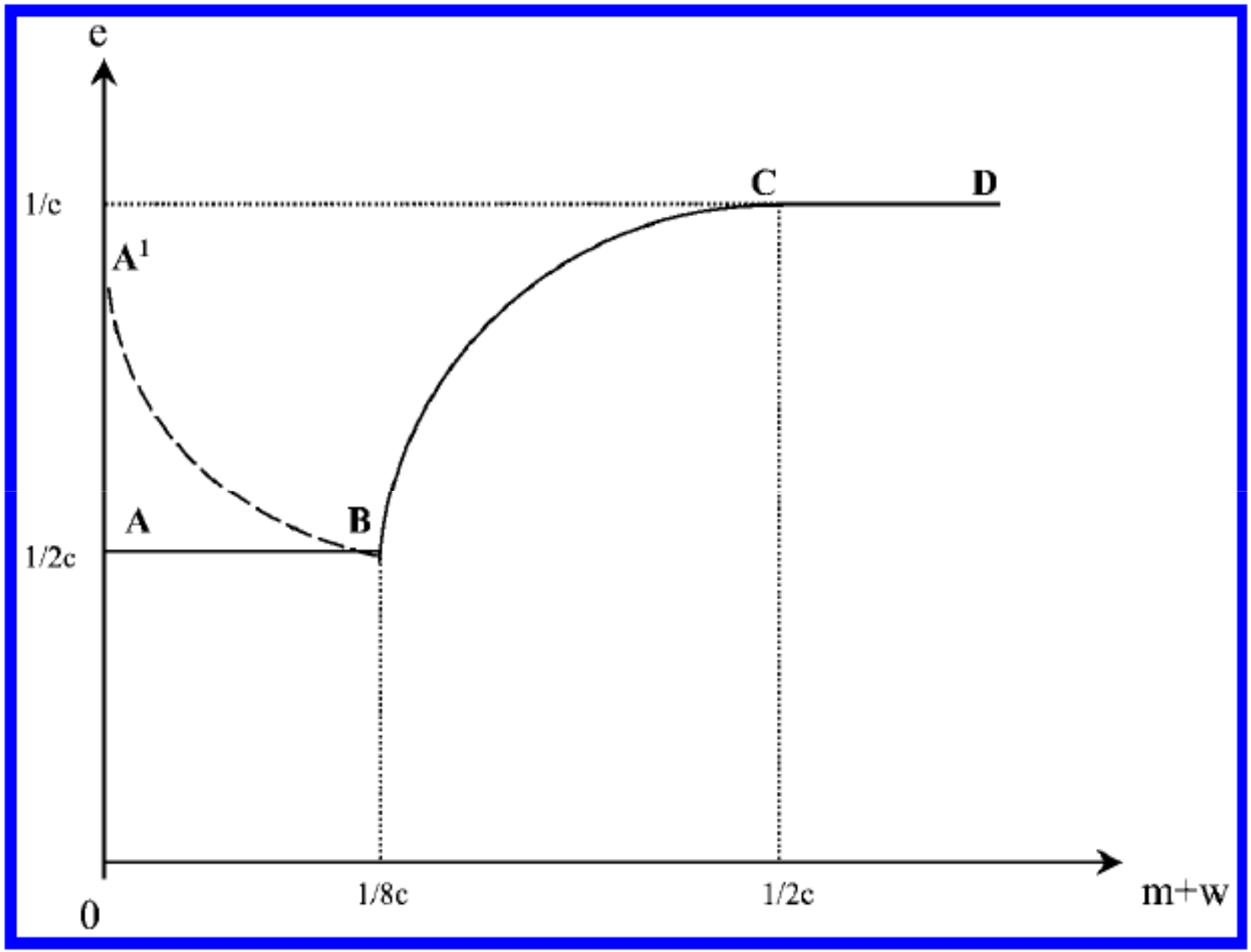
Hence an improvement in the incumbent tenant's outside option always (weakly) increases effort.

RESULT 2. The tenant's participation constraint does not bind as long as $m + w < 1/8c$ and hence he earns rents.

Intuition

- The landlord's trade-off is either to provide incentives or extract surplus.
- A fixed-rent contract maximizes the tenant's incentives
- Always the first choice were the tenant wealthy enough.
- However, the fixed rent is bounded above by tenant's wealth, *w (this is all he has when his crop fails).*
- Therefore, for *small w, fixed-rent contracts are not in the landlord's* interest.
- The landlord can do better with a contract that makes the tenant pay more when he has more (i.e., when his output is high).
- However, this clearly taxes success and therefore weakens incentives.
- This explains why the expected output is less than first-best.
- However, for wealthier tenants, it is easier to extract rents from without sacrificing incentives
- So, expected output approaches the first-best.

- An increase in the tenant's outside option, ***m****, forces the landlord* to pay up more.
- The landlord will want to pay him this extra amount as a bonus for success.
- The tenant thus has stronger incentives to work hard.
- This forms the basis of what we call the *bargaining power effect of the reform: an increase in the tenant's bargaining power,* with everything else held constant, leads to an increase in his share and his productivity.
- Finally, the tenant may earn rents in this model.
- If he has very little wealth and very low outside options, the only way the landlord can extract the entire surplus from the tenant (net of ***m)*** is to take away almost all of the output when output is high.
- Since this obviously has adverse incentive effects, the landlord will typically not try to extract the entire surplus when ***m*** *is very low.*
- *Hence the landlord* will not reduce the share of the tenant below some minimum level, irrespective of ***m****.*
- The curve ***ABCD (slide 13)*** *shows equilibrium effort as a function* of the tenant's outside option and wealth level when eviction threats are absent.


e
1/c
C
D
A1
A
B
1/2c
0
1/8c
1/2c
m+w

Optimal tenancy contracts with eviction.

- A feature of the earlier contract: the tenant earns rent unless sufficiently good outside options.
- So, the tenant strictly prefers tenancy.
- Let us relax the assumption of no eviction – let there be eviction at will.
- Assumed earlier is that tenants of all types (in terms of wealth and outside options) are available in unlimited numbers.
- The landlord is thus indifferent between retaining or firing a given tenant.
- The threat of evicting the incumbent tenant is, therefore, credible.
- Consequently, the threat of eviction if output is low, can be used as an incentive device.
- The landlord can thus typically do better than the one-shot contract detailed above.

The Model

- Let $\bar{V}$ denote the expected equilibrium lifetime utility of a current tenant in the next period.
- Let ***M*** *denote the equilibrium lifetime expected* utility of someone who is currently not a tenant: ***M={ m/(1-δ)}*** *,* ***m*** *defined as above.*
- History independence implies no pre-commitment beyond the current-period incentive contract, ***(h, l)****, and the corresponding probabilities of eviction, (1-φ,1-ψ).*
- It also implies that the tenant's lifetime utility from next period onward, $\bar{V}$ is taken as exogenous in this period by both players.
- Given these assumptions, the tenant's expected lifetime utility in the current period from choosing a level of effort *e today,* $\bar{V}_0$*, must satisfy* the Bellman equation:

$$\bar{V}_0 = \max_{\{e \in [0,1]\}} \{eh + \delta[\varphi e + (1-e)\psi](\bar{V} - M) + \delta M - (1-e)w - \tfrac{1}{2}ce^2\}.$$

- Differentiating this w.r.t e yields the new ICC $h + w + \delta(\bar{V} - M) = ce.$
- Compared to the one-shot model, the existence of rents and foresight reduces marginal cost of implementing effort e by $\delta(\bar{V} - M)(\varphi - \psi)$.
- $\varphi = 1$ and $\psi = 0$ in the optimal dynamic contract.

Remark: As long the tenant gets more than his outside option , neither φ nor ψ affects the landlord's payoff directly (affect the ICC), and it is thus costless to raise eviction probabilities than play around with **h**. PC does not bind.

- Thus we have: $h + w + \delta(\bar{V} - M) = ce.$
- We assume LLC binds, i.e.,$l = -w.$ else the tenant earns no rent and the threat of eviction is non-credible.
- The new PC is $\bar{V}_0 \geq M.$
- Stationary equilibrium implies $\bar{V}_0 = \bar{V}$.
- Hence we get:→

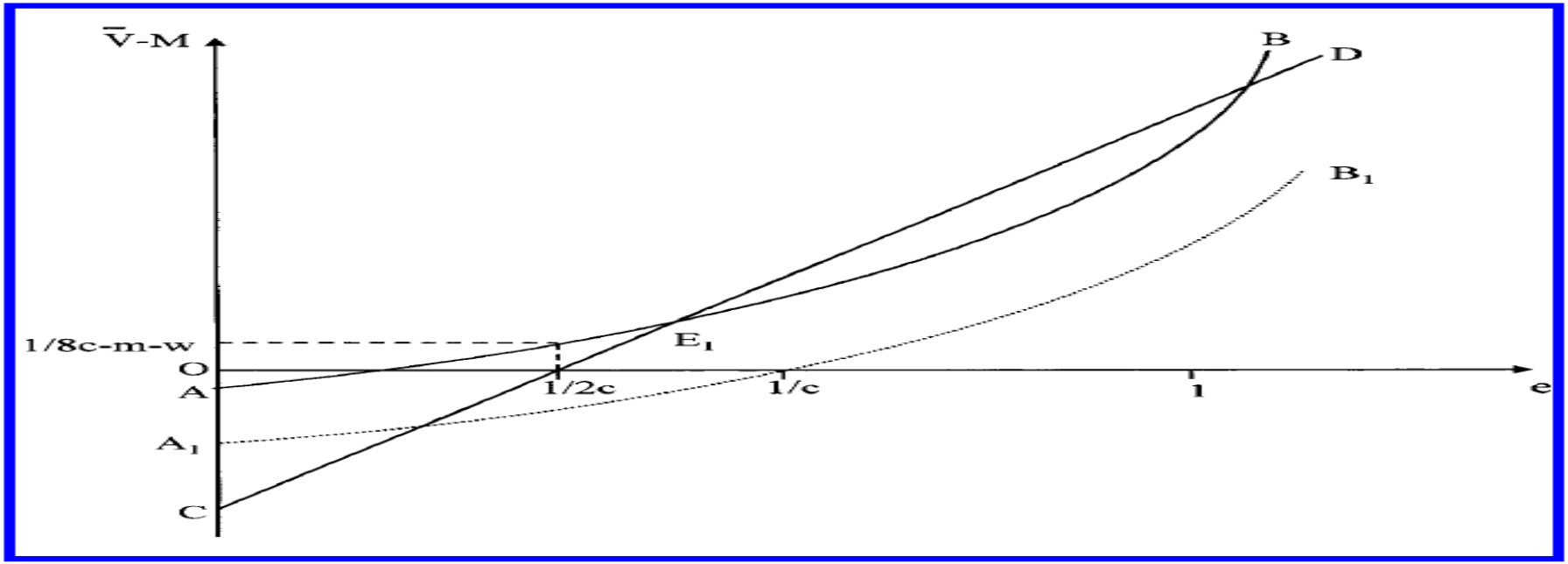
$$\bar{V} - M = \frac{eh - (1-e)w - \frac{1}{2}ce^2 - m}{1 - \delta e}.$$

- Substituting the ICC into the above equation yields: $\bar{V} - M = \frac{1}{2}ce^2 - w - m.$
- In any eviction equilibrium, $\bar{V} - M$ >0
- We reach the landlord's problem, i.e., $\max_{\{e,h,l\}} e(1-h) - (1-e)l$

- Subject to the constraints: the ICC and the LLC.
- The landlord's objective is rewritten as: $\max_{\{e\}} \{1 - ce + \delta(\bar{V} - M)\}e + w.$
- Maximizing this, leads to: $1 - 2ce + \delta(\bar{V} - M) = 0,$

[Remark: The non-binding PC can be interpreted to mean, that compared to the case of no eviction, the tenant faces a trade-off between current and future rewards. So, the relevant comparison is between lifetime expected utility and lifetime outside options.**]**

- Rewritten, we have: → $e = \dfrac{1 + \delta(\bar{V} - M)}{2c}.$
- Using the above equation and $\bar{V} - M = \frac{1}{9}ce^2 - w - m.$ leads us to the equilibrium values of e and $\bar{V}$ (shown in fig. below)



Equilibrium

- These curves intersect at two points, *E1 and E2.*
- *AB* is strictly increasing and convex; *CD is a positively sloped straight* line.
- For $e = 1/2c$, *CD intersects the horizontal axis.*
- *As long as* $(1/8c) - m - w > 0$, *AB is above CD at* $e = 1/2c$
- *For* ***e=1****, CD lies above AB.*
- *Hence only E1, which corresponds* to a value of $e \in (1/2c,\ 1/c)$ is an admissible solution.
- At *E2****, e>1****.*
- *As (m+w) increases, but with* $(1/8c) - m - w > 0$, *continuing to hold, equilibrium e goes down (notice the shift of the curve AB to the right)*
- *Intuitively, rents are smaller and consequently, there is a lower threat of eviction.*
- *The optimal share of the tenant* ***h*-l**** *is given by:* $h^* - l^* = \frac{1}{2} - \delta\frac{1}{2}(\bar{V} - M).$
- *Note:* Since $\bar{V} - M$ goes down when $m + w$ goes up, $h^* - l^*$ must go up
- *When* $(1/8c) - m - w < 0$, *the intersection of A'B' and CD occur at none of the admissible points.*
- *There is no solution to the optimal contracting problem with eviction, where PC does not bind.*
- *The tenant's optimal share, and* ***e**** *take the same values as in the no eviction case.*

Equilibrium…(some more)

- When PC binds, eviction as an option is irrelevant.
- For **(m+w)>1/2c**, effort **e*** is set again at first best levels, **h*-l* =1**, and the LLC no longer binds. Exactly the same as the case with eviction.
- The curve ***A'BCD*** *in slide* ***13*** *shows equilibrium effort as a function* of the tenant's outside option when evictions are permitted.
- It differs from the corresponding curve ***ABCD*** *(for the one-period model) only for* the range of values of ***m*** *such that the tenant earns rents* ***(m +w<1/8c).***
- However, for **(m+w<1/8c), e*** is a declining function of *m when* eviction is an option, whereas it is constant when eviction is forbidden.
- Moreover, since the two curves meet at ***(m+ w=1/8c).***
- *It follows that* the supply of effort is strictly higher when eviction threats are possible for ***(m +w<1/8c).*** *We now arrive at Result 3.*

RESULT 3. 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 with evictions is strictly higher than the corresponding value without evictions. Moreover, over this range, a higher m is associated with a lower choice of e but a higher value of $h - l$.

Conclusions

- The impact of Op. Barga on efficiency may be negative despite the bargaining power effect alluded to earlier.
- The poorest tenants put in considerably more effort when faced with the threat of eviction.
- Unless m increases significantly, effort levels fall as a result of the reform.
- However, the tenants are still better off.
- In an eviction equilibrium, *h is lower and e is higher than in the no-eviction equilibrium;*
- The tenant's utility per period is consequently lower.
- Add to that, if the discount factor of the tenant is lower in an eviction equilibrium than in a no-eviction equilibrium (i.e. $\delta e < \delta$), the tenant's expected lifetime utility is lower as well.
- Applicability of the above analyses excludes wealthier and more able tenants and is limited to tenants who can be easily substituted so that threats of eviction are credible.
- To conclude, one might observe that at the lower end of the wealth bracket landlords resort to credible threats (eviction) whereas at the higher end they fall back on suitable incentive devices (pure rent contracts).