

# Conservation Contracting under Information Asymmetry

Mintewab Bezabih

Edwin Muchapondwa

Martine Visser

# Background

- we seek to characterise conservation outcomes in cases with the double moral hazard problem (Cooper and Ross, 1985)
- context of the north-south (conservation agency-landholder) cooperation in conservation of endangered species
- the north provides contractual funds to compensate the southern partners for conservation effort
- the problem is that the contract is not complete and there is no monitoring; leading to undeclared (mysterious) actions
- conservation agency's mysterious actions (using alternative instrument) punish the conservator and the conservator's mysterious actions (poaching) punish the agency
- two players: the conservator and the conservation agency

# Conservator

- owns land adjacent to a reserve for endangered species
- his land currently used for other activities (e.g. livestock grazing) and can be set aside to increase the habitat of an endangered species
- for successful conservation he would have to withdraw poaching effort  $q$  in the buffer zone at cost  $c(e, q)$ ;  $e$  is given
- gets a contractual  $\$p$  as compensation for (enhancing conservation by) setting aside a buffer zone
- the level of withdrawal of poaching effort  $q$  not observable by conservation agency
- the contract stipulates that if conservation is not successful then the conservator pays fraction of agency's lost value,  $s$

# Conservation agency

- has a budget of  $\$y$  from international contributions to conserve more endangered species in the south
- pays only  $\$p$  to the conservator to secure additional habitat for the endangered species
- receives value of  $z$  from successful conservation and payment  $sz$  from conservator for unsuccessful conservation
- given the risk of shirking by conservator, conservation is only successful with probability of  $\pi(e,q)$
- thus the expected value from conservation is  $\pi z + (1 - \pi)sz$
- conservation agency also invests effort  $e$  in an international ban in trade of endangered species products at a cost  $g(e)$  with the aim of discouraging the conservator from poaching
- level of effort  $e$  not observable to the conservator

# Contract

- the conservation agency will pay  $\$p$  to the conservator to secure exclusive additional habitat for the endangered species
- this requires that the conservator shall withdraw poaching effort  $q$  in the buffer zone at cost  $c(e, q)$ ;  $e$  is not declared
- if conservation is not successful then the conservator shall compensate the conservation agency with an amount  $sz$  equivalent to a portion of the agency's lost conservation value

## IMPLICATIONS OF THE ABOVE CONTRACT

- the conservator decides on the level of poaching effort withdrawal  $q$  and may decide not to withdraw enough
- the conservation agency may decide to invest effort  $e$  in an international ban on trade in endangered species conservation

# Strategic considerations

- Conservator
  - the area set aside for the buffer zone by the conservator is observable but the withdrawal of poaching effort  $q$  over the entire relevant period is not
- Conservation agency
  - the payments going to the conservator are observable but the international ban effort  $e$  of the conservation agency is not observable

# The model

- Conservator

$$\underset{q}{\text{Max}} D = p - c(e, q) - (1 - \pi)sz$$

- Conservation agency

$$\underset{e}{\text{max}} G = y - p + \pi z + (1 - \pi)sz - g(e)$$

# The cooperative solution

- the two agents maximize joint net benefits

$$\underset{e,q}{\text{Max}} D + G = p - c(e, q) - (1 - \pi)sz + y - p + \pi z + (1 - \pi)sz - g(e)$$

- first order conditions for conservation agency and conservator

$$\pi_e(e, q)z = g_e(e) + c_e(e, q)$$

$$\pi_q(e, q)z = c_q(e, q)$$

# The non-cooperative solution

- the two agents maximize individualized net benefits
- Conservator

$$\text{Max}_q D = p - c(e, q) - (1 - \pi)sz$$

$$\pi_q^q(e, q)sz = c_q(e, q)$$

- Conservation agency

$$\text{max}_e G = y - p + \pi z + (1 - \pi)sz - g(e)$$

$$\pi_e^e(e, q)(1 - s)z = g_e(e)$$

# Comparing the solutions

- Cooperative solution

$$\pi_e(e, q)z = g_e(e) + c_e(e, q)$$

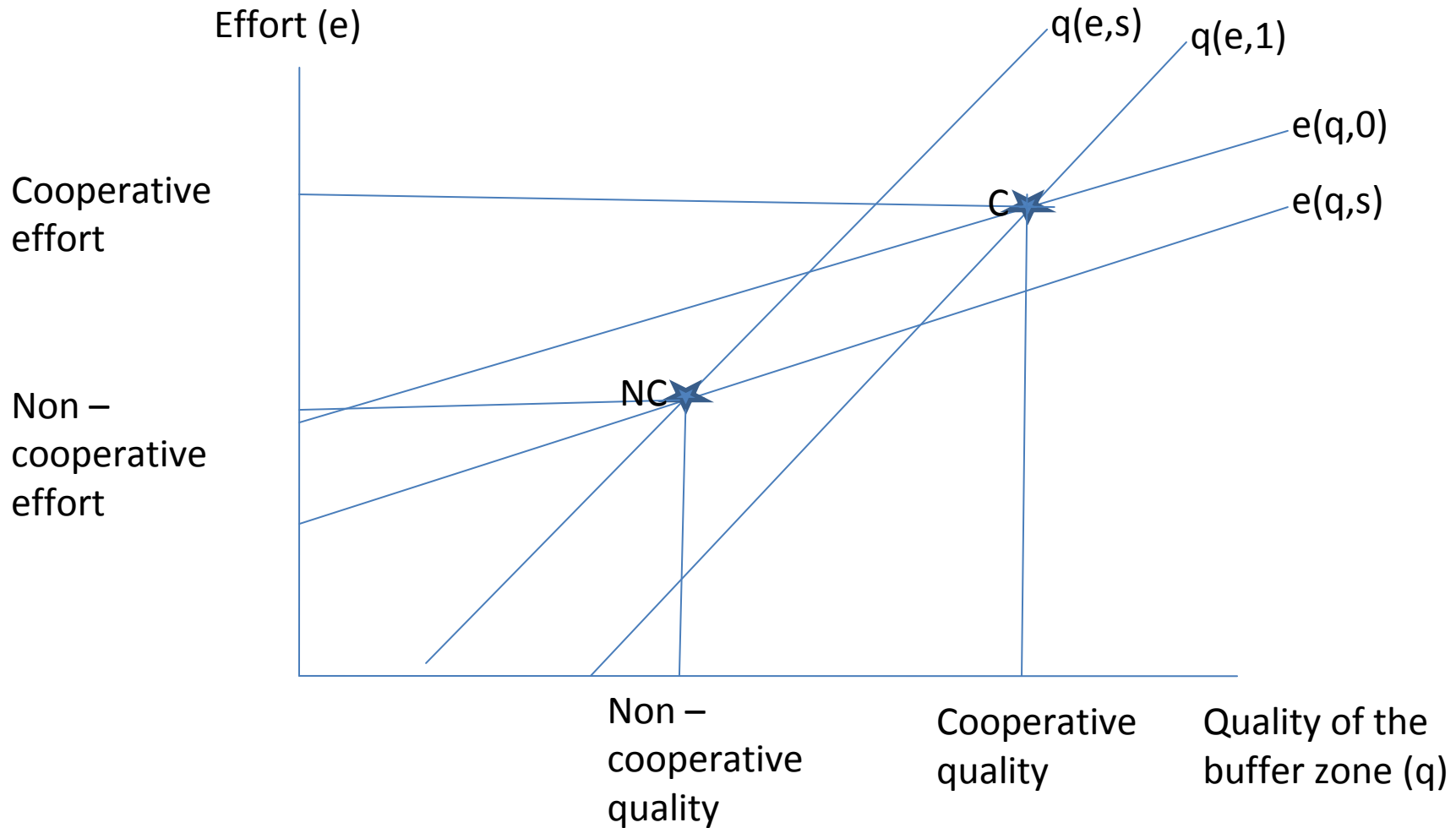
$$\pi_q(e, q)z = c_q(e, q)$$

- Non-cooperative solution

$$\pi_e(e, q)(1 - s)z = g_e(e)$$

$$\pi_q(e, q)sz = c_q(e, q)$$

# Comparing the solutions



# Comparing the solutions

- the cooperative solution entails more international ban effort and more poaching withdrawal and therefore more conservation
- thus, optimal conservation requires a huge investment in international trade ban
- this is difficult to finance and make effective given the tradeoff with payments to conservator
- thus, it is highly unlikely that a cooperative solution will be attained by insisting on a trade ban
- what may actually work is some mechanism which generates the transfer of almost full benefits of the conservation to conservators

# Preliminary conclusions

- the motives for the non-cooperative behaviour on the part of the conservator is associated with him not experiencing the full value of endangered species,  $z$
- letting him directly experience  $z$  can potentially take us to the cooperative solution
- stewardship incentives and payment for ecosystem services seem to be some of the ways through which the conservator can be allowed to experience  $z$  and thereby lead to *more* conservation
- one way of financing these is to disinvest in trade ban effort
- thus, in the absence of elimination of benefits from trade in endangered species, optimal conservation requires transfer of the full benefits of the conservation to conservators

Thank You

# Way forward (1)

- can be cast in a framework where
  - unobservable actions of the conservator constitute poaching for sale on a market
  - unobservable actions of conservation agency constitute investment in a ban on trade in endangered species products
- poaching distracts from successful conservation
- imposing a ban reduces/removes the incentives/benefits from poaching since it removes a market for the poached products
- conservator's net benefits: payment by agency + benefit from poaching + expected value of penalty
- conservation agency's net benefits: income – payment to conservator – enforcement cost – investment in ban + expected penalty receipts

# Way forward (2)

- Is the conservation outcome a binary variable?
- Could start with basic problem then suggest policy instruments to correct problem i.e. impose a ban or pay the conservator full value of conservation; if equivalent which instrument is more effective/preferred? Monitoring problems with PES since one has to be able to measure the extent of conservation (but this is why the contract could not be written comprehensively in the first place); problems of effectiveness of bans and their success does not necessarily depend on investment in it