RELATION-BASED OR RULE-BASED NETWORK GOVERNANCE: CO-MANAGEMENT VERSUS COMMAND AND CONTROL TO PREVENT FISH STOCK DEPLETION

Paul Diederen[1], George Hendrikse[2] and Jan-Willem van der Schans[1]
[1] Wageningen University and Research Centre, Agricultural Economics Research Institute (LEI), P.O.Box 29703, 2502 LS The Hague, The Netherlands
[2]Rotterdam School of Management, Erasmus Universiteit, Rotterdam, The Netherlands

ABSTRACT

This paper analyses alternative governance systems in Dutch sea fishery. It compares two systems, command and control regulation (C&C) to co-management, looking at stability, costs and prospects. It argues that i) governance systems are only viable if they are internally consistent in their attributes; ii) co-management is only stable if the possibility of C&C remains a credible threat and if benefits to fishermen from abiding by the rules under co-management exceed their profits from cheating under C&C; iii) if technological progress reduces the costs of C&C, this may render co-management unstable, even if it would be Pareto-optimal.

Keywords: governance, co-management, regulation, fishery

1. INTRODUCTION

Business firms pursue their objectives and co-ordinate their activities within the confines of an institutional environment. This environment consists of a legal framework, rules and regulations and commonly accepted norms of business behaviour that together determine and direct incentives. Government have policies to shapes the institutional environment with a number of objectives in mind, e.g. stimulating the competitiveness of the economy, protection of public interests.

Over the past thirty years, there has been an evolution in thinking about these policies. Until the seventies, there was a general confidence in the power of 'command and control regulation', of prescribing behaviour and enforcement by inspection. In the eighties, however, it became increasingly clear that prescriptive policies have their limitations. They are rigid and discourage innovation, and enforcement can be very costly. This lead to more deregulation and market based co-ordination. Over the last decade, though, the search for new forms of regulation that surpass the control versus market dichotomy and that make use of new combinations of instruments, has intensified. Central to this new 'smart regulation' is the combined application of diverse policy instruments (property rights, fiscal, information obligations, etc.) that back each other up and the involvement of both public and private parties (Gunningham and Grabosky, 1998).

A case in point is sea fishery in the Netherlands. Fish stocks are a public good and it is in the public interest to prevent depletion of fish stocks. However, fish stocks are very difficult to monitor and police and access to them is hard to control. After an extended period of command and control regulation of access to fish stocks, which resulted in progressive exhaustion of these stocks, the Netherlands has opted for a change of governance system towards co-management. This paper analyses the nature of this change, dealing with the following issues:

- What are the characteristics of viable governance structures?
- Under what conditions is co-management a stable governance system?
- What are costs and benefits of co-management versus command and control regulation?
- What are the prospects of co-management?

The next section describes the Dutch co-management system. Second three introduces a historical parallel and section four analyses the case. The last section concludes.

2. GOVERNANCE OF DUTCH FISHERY

In 1993, the Dutch government introduced a new approach in fishery policies for the catch of plaice and sole, the main products of the Dutch fishing industry. This followed a fifteen year period of mounting tensions between government and fishermen, characterised by expanding regulation that increasingly led to evasion. Regulation included quota, ships licences (limiting engine power), restricted access to specific fishing grounds and restricted days at sea. Evasion mainly took the form of dodging quota and landing more fish than permitted. By 1990, the relationships between fishermen and the government was seriously damaged. This led to a regime change.

The new quota management system, introduced in 1993, was based upon the idea that the public interest was to maintain the biological resources and reproductive capacity of the sea (until then, profitability of fishery had been considered a public interest). Consequently, profitability and therefore quota enforcement was increasingly regarded a private responsibility. This led to a governance system in which groups of fishermen, eight in the Netherlands, formed associations to collectively manage their quota. Participation in such co-management associations (called 'Biesheuvel groups') allows fishermen to exchange quota and co-ordinate their fishing. They commit themselves to play by the rules, most importantly to channel their entire catch through official auctions. Government supports these associations by allowing them 10% extra days at sea. Government has full access to auction data. Transgressions of the rules are penalised. The system is successful in the sense that all Dutch fishermen participate in a co-management group and that evaluations show that the additional flexibility allowed has delivered the average fisherman substantial extra profits.

3. A HISTORICAL PARALLEL

A requirement for efficient exchange is that the parties involved commit themselves to contractual agreements ex ante and honour them ex post. Formal institutions, like the judicial system, are often helpful. However, incomplete contracting theory shows that there are various limitations associated with formal institutions, which makes informal institutions valuable. This is especially relevant in situations where the judicial system is weak and where enforcement is costly, like at sea. Before dealing with these issues in the case of fishery, we first turn to a historical example.

In the twelfth century around the Mediterranean, when communication between wholesalers and their representatives abroad was slow and supporting institutions (e.g. the judicial system) were underdeveloped, two different trading systems developed (Greif, 1993, 1994): a relation-based and a rule-based system. There were two trading areas: Northern Africa and an area around Genoa. The North-African (Maghribi) traders used relation-based governance, a mechanism based on multilateral reputation. All traders collectively punished someone who did not abide by the rules. A cheater would not be hired as a representative by someone else. The prospect of losing all future trade opportunities induced the Maghribi

traders to honour agreements. The social and commercial network generated the required information to detect fraud and spread the news. This choice of enforcement and communication technology only worked if new traders were recruited from the local community. This was a closed community with a horizontal social structure. Every Maghribi trader was wholesaler as well as representative.

The relation-based trading system was informal, based on uncoordinated decisions of traders in various locations. To prevent swindling, consensus was needed regarding cheating. This could in principle also be established with a complete (contingent) contract, but this was impractical given slow communication and the complexity of trade. There are two substitutes for a complete contract. Hierarchy (or authority) can substitute an ex ante complete contract by allocating ex post decision rights to the wholesaler. Culture may substitute complete contracts by specifying ex ante codes of behaviour. The commercial codes of a culture have to be mastered ex ante, while there is ex post no communication necessary between the parties. The opposite holds for a hierarchy. Nothing has to be learned ex ante, while communication between the parties is necessary ex post.

The Maghribi traders used culture, which expressed itself in a code of conduct. In line with their collectivist (Islamic) culture, conviction of joint punishments served as a focal point in this trade system. In the Mediterranean, also traders from Genoa were active. They used rule-based governance, based on a bilateral reputation mechanism and formally supported by government. Being part of the feudal world where bilateral patronage relationships were common, traders from Genoa had a culture with an individualistic orientation. This was in line with Christianity, which placed the individual instead of the group at the centre of theology.

A representative honoured agreements with a wholesaler in this system because the relationship would otherwise not be continued. The judicial system ensured also that agreements were written down, that badly treated parties were refunded and cheaters punished. This individualistic orientation generated a vertical social structure with two groups: wholesalers and representatives. There was an open community: people from outside the Genovese system were easily absorbed in this trading system. The requirement for success of outsiders was only that one had to function well in the bilateral relation within the formal judicial framework (see Table 1).

Table 1. Relation-based versus rule-based trade systems.

Attribute	Trade system Maghribi	Trade system Genoa
Orientation	Collectivist	Individualistic
Reputation mechanism	Multilateral	Bilateral
Agreements	Informal	Formal
Society	Closed	Open
Social structure	Horizontal	Vertical
Functions	Homogeneous	Differentiated

4. ANALYSIS

By drawing parallels with mediaeval Mediterranean traders, this section will deal with viability and stability of governance systems in the Dutch fishing industry and with its prospects.

4.1 Viable governance structures

Systems of governance are complex mechanisms for motivating individuals and for co-ordinating their activities. The different attributes of these systems are interdependent in their

functioning; there may be synergy or 'complementarity' between them, i.e. they reinforce each other (Milgrom and Roberts, 1990). Sound organisational design requires consistency and coherence. Each attribute must complement the others and no contradictions may be among them. Often there is no single 'best' organisational design; there may be multiple equilibria. This shows why system innovation is a major issue. As Solow (1987) observed about the introduction of new information technologies: "You can see the computer age everywhere except in the productivity statistics." To introduce a new technology, however, is to change only one attribute of a system; substantial productivity increases emerge only, once the adoption of new technology is accompanied by changes in supplier relationships, customer relationships, work practices, strategy, and products and services. It also shows why 'all-or-nothing' (Big Bang) change is often preferable over gradual change, though the latter is often observed.

Both the Genovese rule-based and the Maghribi relation-based system of governance, though characterised by opposite attributes, proved viable. Times have changed since the twelfth century. Generally, institutional support for rule-based systems has developed enormously. The legal environment nowadays provides for a delicate balance between protection of public and of private (firms') interests. However, institutional support depends upon availability of and access to information. At sea, this still poses problems: monitoring of fishing activities is costly. Therefore, under these specific circumstances, relation-based governance may deliver results that rule-based systems are unable to.

Command and control (C&C) governance parallels the Genovese rule-based system, whereas the co-management system resembles the Maghribi relation-based system. Clearly, the community of fishermen involved in a co-management group has similarities to the Maghribi: it is a relatively closed, tightly knit community with a horizontal structure and strong social ties. The system works thanks to the fact that fishermen in a group know each other personally; there is ample social control and a common ethical code. Though co-management groups use the services of public agencies to register the catch brought to auction, they are private organisations of fishermen that collectively manage their common interests, that monitor each other and collectively enforce the rules of the group. The pre-1993 C&C system, however, was a type of rule-based governance system, as it governed the relationship between individual fishermen and the state. The system switch in 1993 from C&C to co-management was, indeed, overnight.

Table 2. Co-management versus command and control governance in fishery.

Attribute	Co-management	Command & control
Orientation	Collectivist	Individualistic
Reputation mechanism	Multilateral	Bilateral
Agreements	Private law based	Public law based
Society	Closed	Open
Social structure	Horizontal	Vertical
Functions	All fishermen	Fisherman or civil servant

4.2 Stability of co-management as a governance structure

In this section we consider the strategic alternatives of government and fishermen. Suppose government can choose between imposing a C&C regime or a co-management regime. Fishermen can either abide by the rules of the system or they can cheat. Assume that the following holds:

- government always prefers fishermen to abide by the rules over cheating;

- government prefers co-management if fishermen abide (it lowers monitoring and enforcement costs);
- government prefers C&C if fishermen cheat (then at least some evasion can be prevented);
- fishermen always prefer to cheat, irrespective of the government's strategy (this gives them extra profit);
- fishermen always prefer co-management over C&C (this gives them more flexibility).

Expressing payoffs by ordinal numbers (4 is most and 1 is least preferred) is sufficient to determine preferred strategies. In that case, the payoffs may be distributed as in Table 3.

Table 3. Payoffs.

government	fishermen	
	abide	cheat
co-management	(4,3)	(1,4)
command & control	(3,1)	(2,2)

(x,y) stands for (government, fishermen)

Clearly, (C&C, cheat) is a Nash-equilibrium but it is not a Pareto-optimal solution. Both parties gain if government switches to co-management and fishermen abide. We can conclude:

- The above being a repeated game, the optimum (co-management, abide) is a stable solution as long as cheating by fishermen will evoke a switch to C&C. Co-management works as long as it is backed up by a credible threat.
- For (co-management, abide) to be stable, its payoff to the fishermen must exceed the payoff to them of (C&C, cheat). Note that this does not follow necessarily from the above assumptions – the payoffs might be (4,2) and (2,3) respectively. Government must ensure that abiding in the case of co-management does provide the fishermen with extra gains over cheating under a C&C regime.

4.3 Costs, benefits and prospects of co-management

Costs of running various governance systems differ (Li, 2003). They consist of costs of observation (detection of cheating, communicating this to others) and of enforcement (imposing sanctions). The Mahgribi relation-based governance system had low fixed costs because relationships already existed since members are raised in the community. No system-wide investment is necessary to sustain it. However, its marginal costs are high and rising. Each additional relationship requires a reputational investment. New trading partners are less and less known, and therefore larger initial investments in relationship building are required and the risk of collapse is greater. The Genovese rule-based governance system had high fixed costs, e.g. of setting up legislative and judicial institutions and of establishing credibility. However, the marginal costs of trade expansion were low and almost constant. Additional parties could be dealt with easily once the system was established. The prediction is therefore that small communities will have self-governance, whereas large communities will have official governance.

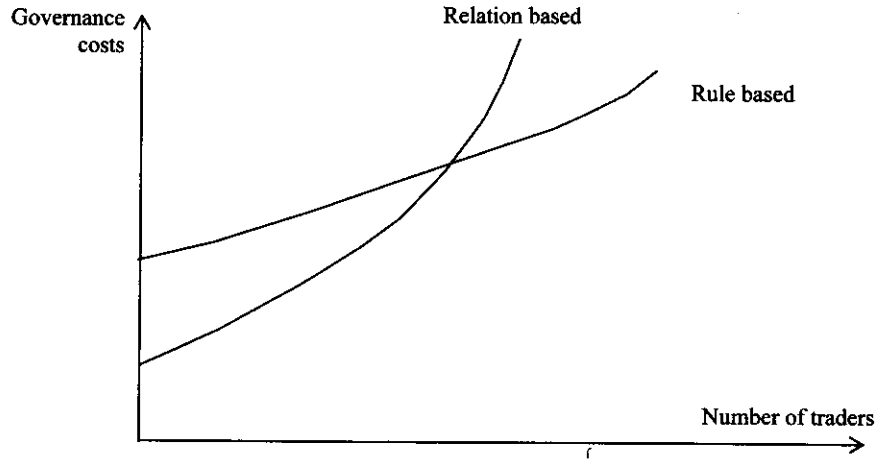

Figure 1. Number of traders and governance costs.

This carries over directly to fishery. Costs of co-management are comparatively low, as long as co-management groups are relatively small and membership is stable. However, as fishermen from other regions in the EU or elsewhere would (legally or illegally) gain access to the Dutch fishing grounds, co-management would no longer work. Two more developments affect the cost structure of governance in Dutch fishery, in opposite direction:

- *Technological change in observation and enforcement.* Applications of ICT, like GPS-systems and satellite observation, make monitoring of fishing vessels and fishing activity progressively cheaper. This lowers the costs of C&C governance relative to co-management (that depends less upon formal observation mechanisms).
- *Concentration.* Like in many industries, the number of firms in fishery gradually decreases. This reduces the costs of co-management relative to C&C.

This may change the sequences of payoffs of the different strategies in Table 3. Suppose the first effect outweighs the second to the extent that C&C gets to be always more attractive for government than co-management. This would change the game into a classical Prisoners Dilemma (see Table 4). Under these circumstances, to maintain a Pareto-optimum, it is not only required that the government threatens to retaliate if fishermen cheat, but also that fishermen threaten to start cheating if the government indicates that it will change the regime. It might be suggested that the latter threat is less convincing and that therefore the optimum solution is more difficult to maintain.

Table 4. Alternative payoffs.

government	fishermen	
	abide	cheat
co-management	(3,3)	(1,4)
command & control	(4,1)	(2,2)

Several stakeholders in fishery have taken initiatives to increase market transparency. One initiative is the Marine Stewardship Council, an independent non-profit organisation that certifies sustainable fisheries and allows products from these fisheries to carry the MSC-certificate on their label. This allows consumers to distinguish and choose between fish products. This increase of market transparency may introduce entirely new possibilities for governance. Currently, markets for fish are homogeneous and anonymous. Consumers cannot choose between fish from sustainable and from unsustainable fisheries. Quota have been introduced to improve sustainability, managed either through a C&C a co-management system. However, if consumers are able and eager to choose, and if they tend to prefer fish from sustainable fisheries (and are willing to pay the required higher price), then government imposed quota may become superfluous and the market may be able to regulate itself. This requires certification and monitoring to work rapidly and accurately. In that case, overfishing quickly results in a loss of certificate, a reaction of consumers and a collapse of the market. If these conditions are fulfilled, governance may develop from co-management into self-management.

5. CONCLUSIONS

This paper has analysed the Dutch system of co-management in fisheries. It has been argued that:

- Governance structures are only viable if they are internally consistent, if their attributes are aligned. A gradual change of governance structure therefore often leads to weaker performance.
- Under plausible assumptions, for co-management to be a stable system, it is required that i) government maintains the possibility of C&C regulation as a credible threat; ii) the benefits of the fishermen from abiding by the rules under co-management exceed their profits from cheating under C&C.
- The fixed costs of co-management systems are generally low, but their variable costs are high and rising. The pattern is opposite in the case of C&C regulation.
- If technological progress makes C&C regimes cheaper for the government, this may render co-management unstable, even if it would be Pareto-optimal. Concentration in the fisheries industry is likely to strengthen co-management. Certification of sustainable fisheries may under restrictive circumstances lead from co-management toward self-management.

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