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**Enforcement Aspects of Conservation Policies: Compensation Payments
versus Reserves**

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Enforcement Aspects of Conservation Policies: Compensation Payments versus Reserves

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Abstract – This model explicitly incorporates the dynamic aspects of conservation programs with incomplete compliance and it allows landholders' behaviour to change over time. We find that incomplete and instrument-specific enforcement can have a significant impact on the choice between subsidy schemes and reserves for conservation policies. The results suggest that it is useless to design a conservation scheme for landholders if the regulator is not prepared to explicitly back the program with a monitoring and enforcement policy. In general, the regulator will prefer to use compensation payments, if the cost of using government revenues is sufficiently low, the environmental benefits are equal, and the cost efficiency benefits exceed the (possible) increase in inspection costs. If the use of government funds is too costly, the reserve-type instruments will be socially beneficial.

Keywords – Monitoring and enforcement, Policy instruments, Conservation policy

I. INTRODUCTION

For more than a decade some major European biodiversity policies, such as the Habitats and Birds Directives, have been in place. The two most relevant instruments used in the EU conservation policy are reserves and compensation payments for conservation practices. Imperfect monitoring and enforcement is proved to be an important factor in the practice of environmental regulation and it will be the focus of this contribution. Turning to conservation policies, [1] find that rule enforcement is a necessary condition to obtain successful outcomes from local resource management. However, in the academic literature little consideration is given to landholders' actions once they have joined a conservation scheme. Therefore, in our model we allow landowners to imperfectly comply with a program's requirements. The reason behind the imperfect compliance is that landholders' actions cannot be directly observed and these actions can only be verified through costly monitoring, resulting in asymmetric information.

Data also corroborate the assumption that compliance with currently implemented conservation schemes is less than perfect: see [2], [3], [4], and [5].

Previous models considering compliance to conservation programs, such as [2], [3] and [5], did so in a static framework while focusing on one policy instrument. Our model, however, explicitly incorporates the dynamic aspects of conservation programs and allows landholders' behaviour to change over time. We also make a distinction between initial compliance and continuing compliance and focus on the difference in monitoring and enforcing compensation schemes or reserves. While most models assume that monitoring and enforcement strategies are independent of the type of instrument used, this assumption no longer holds when confronted with reality. As shown by [6], the type of environmental policy instrument dictates the characteristics and costs of the associated monitoring and enforcement strategy. Indeed, we find that incomplete and instrument-specific enforcement can have a significant impact on the selection of conservation instruments. The results suggest that it is useless to design a conservation scheme for landholders, if the regulator is not prepared to back the program with an appropriate monitoring and enforcement policy. In general, if the cost of using government revenues is sufficiently low and if the associated environmental benefits are similar, the regulator will prefer to use compensation payments over reserve-type instruments, if the reduction in total compliance costs exceeds the raise in inspection costs.

II. MODEL

We analyze a multi-period model with a finite horizon and assume that landholders are risk neutral. Landholders maximize the net benefit from their land. Initially none of these lands have been put to a conservation use. The start-up cost of changing land use practices in order to enhance biodiversity for a landholder tend to be higher than continuing compliance costs because they include learning and conversion costs, changes in suppliers or fixed investment costs such as building fences or planting trees. Due to these cost differences, it is necessary to explicitly

distinguish between initial and continuing compliance. The costs of land conversion or of changing management practices vary between different landowners. We assume, furthermore, that the cost functions are commonly known to both government and landowners, but that only the landholders themselves know their real values.

In order to implement a conservation policy the regulator chooses between two instruments: compensation payments and reserves. When reserves are used, this fixes the number of sites that have to take certain conservation measures. Compensation schemes determine a periodical payment for each landowner who implements a particular practice.

The regulator is responsible for ensuring the landholders' compliance with the policy and randomly performs inspections with positive probability in each period. Every audit entails costs and this inspection cost is high enough so that full compliance is not socially optimal. Further we assume that an inspection can perfectly determine the compliance status of the landowner. A violator who is caught has to pay a fine. The fine that can be imposed depends on the policy instrument used. For a compensation payment scheme, it cannot exceed the cumulative subsidy amounts since this would imply less (voluntary) participation by the target group. Thus, we assume that this fine is equal to the cumulative sum of all subsidies that were already paid to the violator in previous periods. The restitution of all subsidies received so far means that fines are increasing in time and thus deterrence is mounting over time. Furthermore, the sanction imposed on dissenting landholders also implies that the violators cannot receive any future subsidies. This is again a common feature of real life conservation practices. When a reserve-type instrument is chosen, the fine is exogenously fixed in the legislation.

A. Compliance with compensation payments

We distinguish three cases. In case I, it is always profitable for the landholders to implement the conservation measures even without compensation payments. Indeed the conservation costs are already covered by the increase in private land revenues (e.g. fewer fertilizers are needed) after implementation. Thus, the compliance decisions of these low-cost landowners are independent of the enforcement policy. The high-cost landowners in case III would always violate the program's rules, if they would participate, since the costs of compliance are always higher than the highest possible fine that can be imposed, corrected for the change in land revenues. Even with perfect monitoring, it is not optimal for these landholders to comply. For medium-cost landowners (case II) the compliance decisions depend on the monitoring policy. The level of the probability of inspection has to be high enough to convince these

landholders to fulfil the program's requirements during the complete time horizon. If the monitoring stringency is not sufficiently high, these landowners will only execute the necessary management changes when the expected sanction is high enough. Due to the increasing fines, landholders decide to comply once the expected penalty exceeds a certain threshold. If the detection probability is too low, these owners never comply if they decide to participate.

Once we know the compliance decisions of program participants, we can derive the conditions under which it is optimal for them to actually join the conservation program. The low-cost landholder opts to participate in the program under condition that the initial compliance cost is not too high. If the initial compliance cost is higher than the net present value of all future profits from the program, the land manager will not take part in the conservation scheme, even though he would implement the required land use practices once he would have been enrolled in the program. Once the initial compliance cost has been incurred, it can be treated as a sunk cost and thus only the (lower) continuous compliance costs are relevant for future compliance decisions. If the landowner would never comply with the program's obligations, he would also opt not to take part in it, since the initial compliance cost is even higher than the cost of continuing compliance. If the monitoring policy is such that medium-cost landowners only start complying after a certain time, we find that these landowners will participate in the conservation program if their initial compliance costs are sufficiently low.

B. Compliance with reserves

When the regulator decides to use reserves as a policy instrument, the landholders in a particular region are legally obliged to implement certain conservation measures. A fixed percentage of plots need to be sustainably managed. The landowners who are targeted by the policy can choose to comply with the rules or not. With a probability p landowners are inspected and, when a violation is detected, the violator has to pay a fine and he is forced to comply in that period. Again it initially costs more to start implementing the required practices than to continue compliance with the regulation.

The compliance behaviour of the landholders with a reserve instrument is described as follows. A low-cost landholder is always compliant, since implementing the conservation measures is less costly than paying the expected fine. Medium-cost owners will postpone initial compliance until the violation is detected and they are forced to incur the initial compliance costs. Afterwards, because continuing compliance costs are lower than initial compliance costs, they continue to adopt the mandated

conservation practices. The second group of medium-cost landowners start by complying with the policy in the first period because they can save paying the expected fine for one period (corrected for the change in private land revenues). The high-cost landholders never comply, since they find it less expensive to pay the expected fine(s) than to pay the compliance costs.

III. CHOICE OF POLICY INSTRUMENTS

Compensation payment schemes and reserves each have a different impact on welfare. The effect on environmental quality depends on the variation in conservation benefits over the different sites. Thus, we cannot draw any general conclusions about the relative effect of both instruments. If the regulator knows which plots are likely to provide higher conservation benefits, reserve schemes can be targeted toward those plots. This would imply that reserves can yield a higher environmental benefit than subsidy payments. The use of reserves in settings with high conservation benefits is indeed something we observe in reality. In a situation where a failure to act has irreversible consequences or where conservation is incompatible with human actions, reserves are probably the most appropriate instrument to use. Compensation schemes can be used, for instance, in an established agricultural landscape to stimulate conservation therein. To keep the analysis tractable, we assume, however, that the conservation benefits are uniform. This implies that both policies have exactly the same effect on the environmental quality since they both reach the policy target. The same situation would hold true if there is no information on the individual environmental benefits but only on the distribution of conservation benefits. The regulator would then assign the same expected benefit to conservation measures for each plot in the region.

Total landholders' revenues under a compensation scheme are always larger than under a reserve scheme. First, the landowners are compensated – at least in part – for their costs and, second, only the lowest cost landholders will participate in the program since subsidy schemes are cost-efficient while reserve schemes are not. In order to rank the two policy instruments, we also need to consider their impact on government revenues. The compensation scheme will always cost the regulator more than a reserve policy, since subsidy payments as well as inspection costs increase. Depending on the cost of government resources, we distinguish two cases. If the compensation payments are costless transfers, compensation schemes will increase social welfare compared to reserves if the reduction in total compliance costs (cost efficiency) exceeds the increase in inspection costs. In the second case, government funds are costly to use because they are financed by distortionary

taxes. Then the regulator will still prefer to use compensation payments if the marginal cost of public funds is sufficiently low and the higher inspection costs do not outweigh the cost-efficiency benefits. However, for a sufficiently high marginal cost of public funds, the use of reserves will become socially beneficial.

IV. CONCLUSIONS

This paper shows that incomplete enforcement guides the regulator's choice between compensation schemes and reserve-type instruments. Compliance with regulations cannot be guaranteed without effort from the regulator and this has implications for the government budget. Monitoring and enforcement aspects should thus be more plainly incorporated in conservation policies and part of the programs' budgets should be explicitly earmarked toward this end. Designing adequate monitoring and enforcement strategies is thus one of the upcoming challenges for European conservation policy. Our analysis shows that, if there is no information on the conservation benefits associated with each plot or if these benefits are equal across the region, the regulator will weigh the efficiency and enforcement benefits of compensation schemes with the costs of using government resources to pay the subsidies.

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