

Public Preferences, Statutory Regulations and Bargaining in Field Margin Provision for Ecological Main Structures

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Abstract

Political procedures aimed at solving conflicts are becoming popular in agri-environmental economics. They are considered as substitutes for market transactions. Ecological lobbying groups put pressure on politicians to enforce ecological main structures, while farmers oppose them. Undefined property rights pose problems and statutory regulations are discussed. The paper applies a political economy model of social bargaining to the provision of an ecological main structure. It shows how a tragedy of the commons problem may prevail. Then it outlines a social optimum of field margin provision. Finally, it provides a solution to the establishment of socially acceptable rules in a political economy framework. Also, a payment scheme is introduced.

Keywords: *Political economy, bargaining model, field margin provision, ecological main structure, statutory regulations and institutional change*

Introduction

There is a growing concern that current agricultural practices endanger the environment. Environmentalists challenge the right of farmers to pursue, in their opinion, environmentally dangerous practices. Vice versa, the farm sector challenges the request of environmentalists to dictate them the mode of farming. There appears to be a large conflict between competing interest groups, in which the government no longer seem to have a well accepted set of policies that goes along the pure concept of property rights distribution (Hodge, 1988).

In this context, the provision of agricultural main structures has received political attention. Ecological main structures shall be built in the countryside of many industrialised countries, in order to maintain ecologically high potential areas and integrate these areas into a well connected net of habitats and corridors. Ecologically oriented interest groups put pressure on the public, in order to enforce a realisation of these main structures on the basis of previously privately owned farmed land at low or almost zero compensation payment due to otherwise strong financial outlets (in Germany as "Biotopverbundsystem", SPD, 1998; and in the Netherlands as "Structuurschema Groene Ruimte", Oskam and Slangen, 1998). Some ecological pressure groups are unaware, that farmers will demand compensation and perceive main structures as being beneficiary to farmers per se. They neglect property rights issues. Also, public involvement is very high when it comes to spatial planning of land use which applies geographical information systems (Berry, 1993). Approaches to implement planned structures contain prescriptions on land use, that in the opinion of farmers violate their property rights.

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One can easily imagine that farmers strongly oppose such types of central planning. Farmers have incidentally lobbied against plans to integrate them into a community based structure. In particular in Western Europe, larger, more modern and market oriented farmers have a high stake in negotiations with authorities of regional land management, as they fear to lose flexibility in terms of farming operation, necessary to remain competitive. It becomes increasingly evident that political economy bargaining may become a problem solving tool.

It is the intention of this paper to provide insight into the political economy bargaining process that underlies the provision of ecological main structures. It is first argued that statutory regulations may already solve the problem of agricultural main structure provision. The argument draws on the public goods character of ecological main structures. However, that solution may not be socially optimal. Therefore, this paper is also concerned with the provision of the social optimum. It discusses institutional amendments, such as the introduction of payment schemes. The aim is also to provide a set of solutions to the problem of establishing rules for individual farmers in field margin provision for wildlife and landscape conservation, which are socially accepted. Moreover, it is shown how institutional amendments, such as property rights distribution, impact on the welfare function of interest groups. Solutions will explicitly recognise group specific bargaining powers and public good aspects, as well as highlight the constitutional prerequisites from the government side.

The paper is organised in six sections. First, the background of institutional deficits and related public preference formation are discussed. Second, a framework for the provision of ecological main structures is outlined, which employs the basic concept of field margins. Third, it will be indicated that farmers' behaviour can be explained from the tragedy of the commons paradigm. Fourth, a social planner will be introduced, and fifth, the social planner will be affected by bargaining problems. Sixth, suggestions for institutional variations will be made. Throughout the paper it is shown how political economy modelling fits with the economy of field margin provision and with different institutional arrangements. However, the emphasis of the paper is on the modelling perspective and the provision of a research agenda on political economy aspects in field margin provision.

Background for Political Economy Modelling of Public Preference and Institutions

Environmental economics and policy in the agricultural sector is confronted with serious problems in property rights definition due to the public good characteristics of most "commodities" in ecological main structures (on market failures see Hanley et al. 1997; in the context of agriculture see Hodge, 1991). There is evidence that the political domain can be not capable to attribute pure property rights in terms of the mode of farming either to the farming sector or the general public, solely based on principles like the polluter pays or beneficiary principle, and, then, wait for the market solutions (Frouws, 1997). Despite of ample suggestions that institutional changes, which alter property rights, would be an appropriate mean to solve conflicts (Hodge, 1988), existing strategies for solving conflicts increasingly involve piecemeal and ad-hoc regulations on farm practices. Regulations have been suggested after intensive bargaining between environmental pressure groups and the farm lobby (Frouws, 1997).

There are manifold reasons why the property rights approach is less successful in environment-agriculture-conflicts. Especially if the political support is insufficient, it may happen that policy makers abstain from distributing rights (as first step involving high conflict potentials) and wait for market solutions (as second step enabling conflict free market transaction). But, not only a weak policymaking process can be the reason for bargaining solutions (Rausser and Zusman, 1992). Transaction costs, that guarantee

property rights or enforce contracts, can also be high. Since ecological goods are mostly public goods, individuals have only minor incentives to contribute to them. Due to supervision and consensus problems, pure property rights attributions seem to be less practicable in agri-environmental policy.

Political bargaining solutions to conflicts along economic interests are typical for many spheres of public intervention into behaviour and conduct of economic agents. Bargaining solutions result in the determination of policies that alter private behaviour on behalf of the general public. Especially where distribution conflicts are of great concern, political systems of whatever constitutional design tend to provide solutions to policy determination that are not reflected by the behaviour of an impartial agency (Zusman, 1976). Presumably, a similar situation may prevail in the provision of ecological main structures.

Though political economy modelling of public bargaining in conflicts between environmentalists and vested interest groups has evolved only recently in agriculture, it can draw on existing frames of political economy modelling in environmental economics (Bartsch, Rauscher, and Thomas, 1993; and Rauscher, 1995). Existing literature in political economy suggests the application of rent seeking and pressure group formation approaches (Peltzman, 1976 and Pashigian, 1985). There is great scope to use experiences from modelling of distribution conflicts in agriculture (Bullock, 1994 and for a review: Swinnen and Zee, 1993) for an analogous modelling of governments in environmental conflicts. The above mentioned political economy approaches in agri-environmental conflicts can also draw on experiences from actual conflict solving mechanisms and processes (Frouw, 1997). The following model is based on these concepts. It investigates the role of an endogenous government in controlling field margin provision and does not treat governments as exogenous (Rausser, 1992). Because pure property rights approaches (Hodge, 1988 and 1991) have essentially failed to provide accepted rules in agri-environmental conflicts, the presented political economy model considers an "endogenous government" that derives statutory regulations (field margins) for an empowered manager. The model offers a rigorous description of community based processes that simultaneously generate public preferences, shape institutions, and guarantee power to managers. Also, modelling will not depict an impartial process, but, offers a revealed power structure.

A Framework for Farmers' Participation in Ecological Main Structures

The basic analytical framework for the description of farmers' participation in ecological main structures focuses on the spatial allocation of land by farms (Wossink, et al, 1998). That frame enables a formulation of Rausser's and Zusman's (1992) initially time oriented model. This framework is necessary in order to reduce the two dimensions of space and farms in one dimension of decision making of farmers given a limited space. It also provides a tool for empirical application, since field margins and size of the main structure must be displayed. Diagram 1 shows the basic idea of a plot-oriented type of agriculture including field margins.

The latitudinal axis with equal distances of $a_1, a_2, \dots, a_i, \dots$ to a_n shows the horizontal stretch of a farming community at equal distances of fields (most ideally conceived in a Dutch polder or new settler framework of land distribution). Farm size differs on the longitudinal-axis allowing farms to have different sizes according to longitudinal distances $x_1, x_2, \dots, x_j, \dots, x_m$. This framing of farmland enables us to depict land allocation of farmers and the implementation of ecological main structure in the mode of field margins. From definition of the original size l^*_{ij} of a field we derive:

Next, the area contributed to the ecological main structure f^*_{ij} , that can be identified on field “i” of a farm “j”, can be depicted as percentage of the size of the field. Using a Taylor series expansion for a rectangular field “ $a_i \times x_j$ ” multiplied by a percentage b_j , we receive an approximated f_{ij} as size of field margin, applied, depending on b_j

with $0 \leq b_j \leq 0.2$ and $a_i b_j^* \cdot x_j' b_j^* \cong 0$

In this formula, the part of the latitudinal-axis, i.e. distance of the field “ a_i ”, is already measured by the length of a farm “A” divided by the number “n” of fields (equal length of field “a” and half distance of x). The advantage is an equivalent expression of a constraint imposed by an ecological main structure “B” by the “length” of a farm (Rausser and Zusman, 1992: time frame becomes a spatial frame and “B” expressed in field margins). For instance, if 3000 hectares have to be obtained from 1000 farmers, each farm has to provide a size of 3 hectares:

$B \leq \sum_i \sum_j a_i x_j b_j$; and since $A = \sum_i a_i$ by assumption:

$$B \leq \sum_j A x_j b_j \Leftrightarrow A \leq \frac{B}{\sum_j x_j b_j} \quad (4)$$

This spatial presentation helps to specify the individual use of agricultural farmland, including the provision of field margins b_j , in terms of the overall constraint imposed on farmers.

$$l_{ij} = (1 - b_j) l^*_{ij} = (1 - b_j) x_j A/n = (1 - b_j) x_j \frac{B}{n \left[\sum_j x_j b_j \right]} \quad (5)$$

Having specified the individual farmland, we can proceed to model farm behaviour.

Farmers Behaviour towards Field Margin Provision for an Ecological Main Structure

This section on farm behaviour deals with two aspects. First, a possible voluntary provision of field margins by farmers has to be established. This should be done on the basis of farm behaviour that corresponds to the micro-economic theory of farmers. Second, it is shown that an ordinary profit maximising farmer has limited incentives to provide field margins (tragedy of the commons: Rausser and Zusman, 1992).

Allocation of field margins towards ecological main structures has to be seen in conjunction with the use of agricultural land. The applied micro-theory approach of a farm is similar to the one of Nuppenau and Slangen (1998). It distinguishes between conventional farming on the remaining field and conditional farming on field margins, given restrictions in farm practices (as special case, field margin are with no farming dependent on biological interest). Frequently mentioned restrictions are “not spraying of chemicals, lower fertiliser rates” etc. (Wossink et al. 1998). Positive ecological effects (cost reduction due to higher biological activity) from the main structure are regarded as public goods. Harvests from field margins remain private. The adjusted total profit is recalculated using both crop yields on field “i”. Thus, profits are essentially determined by land allocation between the rest of the field and the field margin. Theoretically, the objective function of a representative farmer in field margin provision corresponds to a constrained optimisation approach (Chambers, 1988).

$$\Pi_{i,A} = \sum_i [p_j l_{ij} - C(l_{ij}, b_j, B, r_j)] \quad (6a)$$

(+) (+) (-) (-) (+)

where: increase: “↑” and decrease “↓” :

- p_j = adjusted gross margins per hectare, including yields, (profit↑)
- l_{ij} = remaining area of the field i on farm j, area cropped, (profit↑)
- $C(.)$ = cost function on quantity of q_{ij} at field l_{ij} with the yield $h = q_{ij}/l_{ij}$,
(cost↑=>profit↓)
- b_j = percentage field margins, cost reducing by biological activity (cost↓=>profit↑)
- B = size of the community based ecological effect from main structure
(cost↓=>profit↑)
- r_j = input costs, farm specific (cost↑=>profit↓)

In case of a regulator's influence on field margins, as a percentage: b_j , profits are adjusted to

$$\Pi_{i,A} = \sum_i [p_j x_j^* a_i (1 - b_j) - C(x_j^* a_i (1 - b_j), b_j, B, r_j)] \quad (6b)$$

with constant latitude a : $x_j^* = a x_j$

Assuming linear homogeneity in land with respect to the cost function and equal distance of fields on the horizontal axis, $\sum a = A$, the sum of profits from fields "i" can be rewritten as:

$$\Pi_{i,A} = A [p_j x_j^* (1 - b_j) - C(x_j^* (1 - b_j), b_j, B, r_j)] \quad (6c)$$

Introducing the ecological constraint "B", depicted as the recalculated A from farm length in equation (4), profits on an individual farm can be expressed as dependent on individual allocation " b_j " of field margins *and* communal achievement (requirement) of field margin B.

$$\Pi_{j,A} = \frac{B [p_j x_j^* (1 - b_j) - C(x_j^* (1 - b_j), b_j, B, r)]}{\sum_j x_j^* b_j} \quad (7)$$

For interpretation: A community of small farmers may decide on B, but only, because a pressure on all of them requires the allocation of field margins. The question remains: Will individual optimisation behaviour go for the b_j 's recognising the positive effects on B? Nothing has been said on voluntary provision of field margins for the ecological main structure and benefits to individual farmers. As a public good the ecological main structure "B", i.e. the empirically measurable equivalent of nature provision by the *community of all farmers*, is only of potential interest, but may not appear due to common property problems. To sketch the argument, we look at the optimisation in (7) by setting first derivatives equal 0:

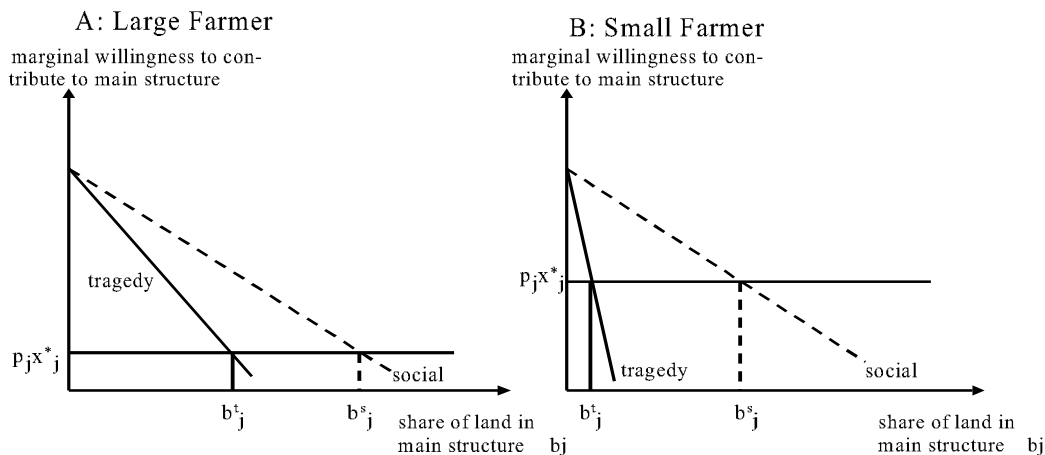
$$\frac{\partial \Pi_{j,A}}{\partial b_j} = \frac{-B [p_j x_j^* + C'(x_j^* (1 - b_j), b_j, B, r)]}{\sum_j x_j^* b_j} + \frac{B [p_j x_j^* (1 - b_j) - C(x_j^* (1 - b_j), b_j, B, r)] x_j^*}{-[\sum_j x_j^* b_j]^2} = 0 \quad (8a)$$

$$\Leftrightarrow \frac{\partial \Pi_{j,A}}{\partial b_j} = [p_j x_j^* - C'(x_j^* (1 - b_j), b_j, B, r)] - \frac{\Pi_{j,A} x_j^*}{B} = 0 \quad (8b)$$

Equation (8b) consists of two parts. The first part [...] shows that the determination of field margin size is dependent on *private* marginal costs. The second part can be interpreted as the share of farm j's profit in the provision of the *public* ecological main structure. Two cases can be distinguished. Case one: For the first part we assume, that on the individual farm the positive impact on cost reduction of the own field margin b_j is small (while the impact of B may be high) and, for the second part, we assume, that the profit share is also small for a large number of farms. If individual shares can be neglected, narrowly rational farmers will not provide the envisaged main structure (zero supply as special case of the tragedy). Since the impact of the main structure as a public good can be neglected, i.e. a limited size of B ($\lim B \rightarrow 0$) or dominant strategy of no co-operation, the tragedy of the commons argument applies (argument follows Rausser and Zusman, 1992). In case two, farmers will focus on the first part [...] (maybe field margins contribute positively), but, no political pressure exists, then they will still contribute only limited to the size of the main structure (under supply). However, the size and intensity of farming matters. The situation is verified in Diagram 2. Farmers will

contribute differently, but at very low levels, to the main structure. Note, the willingness to contribute, in the case of the "tragedy of the commons" (equation 8), is independent of the level of "B" and a divergence between social and private (tragedy) marginal willingness to contribute occurs.

Diagram 2: Farmers' individual willingness to contribute



Farmer will try to avoid contributing to the main structure (tragedy of the common or Nash equilibrium). There is scope for institutional change. As suggested in Diagram 2 (sketched line, indicated as social), a shift in the marginal willingness to contribute to the main structure from an individual point of view is welfare improving and occurs if farmers would be sure, that others also contribute. The question is: How can we establish a social objective function by political bargaining processes?

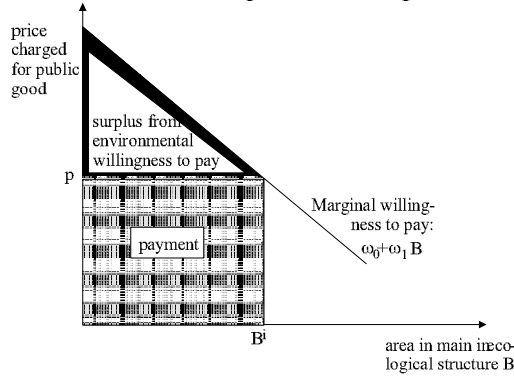
Individual Objective functions and Social Evaluation of Welfare Functions

The provision of an ecological main structure as a socially oriented exercise implies an *explicit* formulation of public preferences that refers to the ecological main structure as an entity on the basis of individual preference and community preferences. From a technical point of view, i.e. social engineering, a determination of the social function could simply be done by summing up individual objective functions of farmers. But, as farmers have different powers, simple summing up is abandoned. A simple summation does not reflect the problem. It provides only, as an ex post inference, the possibility to construct a reference simulation.

Moreover, we need a formulation of the environmentalist's objective functions and a procedure to merge farmers and environmentalist objective functions. Since environmentalists have a strong interest in main structures, their welfare, and later to be derived from welfare, their interest has also to be recognised. Environmentalists, as a group, are assumed to have a marginal willingness to pay function (demand function) that depends on the absolute amount of ecological main structure, as a public good "B", at price p_E . Diagram 3 shows the argument. If the "demand" is a linear function, the welfare is quadratic: $U_E = \omega_0 B - 0.5 \omega_1 B^2$. This would give, after market optimisation as a reference system, an equilibrium condition of $\omega_0 - \omega_1 B = p_E$, i.e. if prices are charged. The surplus is the shaded area above the price line. Without payment, presuming lobbying, the area of surplus and payment applies. Depicting the interest function in situations of ill-defined property right, surplus and payment remain with the lobby group.

In short: If markets do not exist, the political economy becomes the substitute, though the economic framework remains. Using contingent evaluation methods the willingness to pay function reveals interests. Technically, willingness to pay functions express benefits of the main structure as area below a demand function independent of the property rights.

Diagram 3: Willingness to Pay and Pricing



Bargaining Solution

Objective functions

Since it was assumed that no a-priori property rights distribution exist for the establishment of an ecological main structure and no benevolent dictator can be expected, a bargaining solution will most likely appear after a process of intensive negotiation. It is now the intention to

outline explicitly the corresponding model and to show how conditions in bargaining situations can be compared with the tragedy of the common and social planner solutions as benchmarks. In effect, the bargaining solution should theoretically comprise the situation of the tragedy of the common *and* the situation of a benevolent social planner as special theoretical cases. Applying the theory of social power (Zusman, 1976) we obtain a flexible explanation of different power situations.

The theoretical explanation of the bargaining solution will offer several insights *into* and quantification *of* the political economy process, as involved in the determination of environmental policies. First it shows the *real* power of individual groups, such as farmers, the common property managers, and environmentalist. Second, it can distinguish between the social power function (production function to achieve group interest) and the necessary amount of input, (resources devoted by the pressure group to achieve the output, "social" preferences). Third, observable results of the bargaining process are related to power coefficients and fourth, it is shown how constitutional amendments change the results of games with the same "political technology", available to groups (Rausser and Zusman, 1992).

For that purpose, slight modifications of the group objective function are needed. First, the environmentalists pursue lobbying activities that cost them c_E amounts of resources, say money. Lobbying cost is internally determined, presuming a "production" function of lobbying. Consequently the beneficiaries' (environmentalists) interest (utility) is changed to:

$$I_E(B) = \omega_0 B - 0.5 \omega_1 B^2 - c_E \quad (13)$$

Second, this specification requires the corresponding specification of farmers' interests. For the purpose of *explicitly* specifying farm interest functions, the financial resources c_j by a farmer for lobbying is deducted from profits. (The profit has been discussed in equation 7).

$$I_j = \frac{B[p_j x_j^*(1-b_j) - C(x_j^*(1-b_j), b_j, r)]}{\sum_j x_j^*(1-b_j)} - c_j \quad (14c)$$

Third, the manager's objective function is characterised by its task to enforce "public interest" and the ability of the pressure groups to influence this "public interest", simultaneously. The "public" summarises over all farmers and environmentalists and we finally receive the interest function of the centre. Enforcement power, however, is only given to the manager on the basis of his capacity to pursue the "revealed preference" for the society. The manager's objective function is composed of the farmers' " $\sum I_j$ " and the environmentalists' " I_E " interest *plus* the lobby activities expressed as penalty/reward functions, s_F and s_E , of pressure groups, respectively. The lobbying activities alter the welfare of a political centre as a manager, since the activities comprise reward and penalty elements for the manager, without which he would be the benevolent dictator. Note that groups or farmers can be modelled as:

$$I_C = \sum_j I_j + \sum_j s_j(c_j, \delta_j) + I_E + s_E(c_E, \delta_E) \quad (14a)$$

Therefore, this general specification I_C includes farmer's interest function specification PI_j .

$$I_C = \sum_j \left[\frac{B[p_j x_j^*(1-b_j) - C(x_j^*(1-b_j), b_j, r)]}{\sum_j x_j^* b_j} \right] + \sum_j s_j(c_j, \delta_j) + \omega_0 B - 0.5 \omega_1 B^2 + s_E(c_E, \delta_E) \quad (14b)$$

Bargaining Equilibrium

The model of the bargaining centres around Harsanyi's (1963) multiple agent model. In that model a bargaining process can be finally modelled as a specific functional form such as:

$$L = [\prod_j (I_j - I_j^0)] (I_C - I_C^0) (I_E - I_E^0) \quad (15a)$$

Our interior solution to be derived is similar to the one prescribed by Rausser and Zusman (1992). The solution is similar to a weighted objective function. In that function, individual weights correspond to the power of the pressure group. As Zusman (1976) has shown, the bargaining solutions are not the same as policy preference function approaches. Instead, the author shows that the weights reflect the analytic properties of both aspects, the "production function" aspect and the "resources devotion" aspect in bargaining. Following the arguments and proves of the above authors, a much more treatable version of equation (15a) is given in (15b):

$$W = \sum_j [1 + w_j] \left[\frac{B[p_j x_j^*(1-b_j) - C(x_j^*(1-b_j), b_j, r)]}{\sum_j x_j^* b_j} \right] + [1 + w_E] [\omega_0 B - 0.5 \omega_1 B^2] \quad (15b)$$

Here, the weights $w_1, \dots, w_m$, and w_E correspond to the ratio of achievements (optimal interest function in the bargaining process as the first derivative of the strength, that is acquired from the threat strategy not to co-operate) minus the reference interest, and formally:

$$\dots; w_j = \frac{(I_C^{opt.} - I_C^0)}{(I_j^{opt.} - I_j^0)} = \frac{\partial s(c_j, \delta_j)}{\partial c_j}; \dots; w_E = \frac{(I_E^{opt.} - I_E^0)}{(I_E^{opt.} - I_E^0)} = \frac{\partial s(c_E, \delta_E)}{\partial c_E} \quad (16)$$

Finally, calculating derivatives b_j' of the public welfare function "W" provide a solution:

$$\frac{\partial W}{\partial b_j} = B(1+w_j) \left[\frac{[p_j x_j^* + C'(x_j^*(1-b_j), b_j, r)]}{\sum_j x_j^* b_j} + \frac{x_j^* [p_j x_j^*(1-b_j) - C(x_j^*(1-b_j), b_j, r)]}{-[\sum_j x_j^* b_j]^2} \right] = 0 \quad (17a)$$

$$\dots$$

$$\frac{\partial W}{\partial B} = (1+w_j) \frac{[p_j x_j^*(1-b_j) - C(x_j^*(1-b_j), b_j, r)]}{[\sum_j x_j^* b_j]} + (1+w_E) [\omega_0 - \omega_i B] = 0 \quad (17b)$$

To solve this system explicitly, an assumption on the cost function is needed. Linear supply and factor demand functions correspond to quadratic cost functions (Nuppenau and Slangen, 1998):

$$C(x_j^*(1-b_j), b_j, B, r) = \gamma_{0j} b_j + 0.5 \gamma_{1j} b_j^2 + \gamma_{2j} b_j r_j + \gamma_{3j} B + \gamma_{4j} B^2 + \gamma_{5j} B b_j;$$

for simplification γ_{ij} coefficients cater for scaling). Inserting equation (17b) in (17a) and using that quadratic approximation of individual optimality conditions for farms we receive, as result in bargaining:

$$(1+w_j) [p_j x_j^* - \gamma_{0j} + \gamma_{1j} b_j - \gamma_{2j} r_j] - (1+w_E) x_j^* [\omega_0 - \omega_i [\sum_j A x_j^* b_j]] = 0 \quad (18a)$$

For all b_j we get a new system of m -equations that can be solved for $\mathbf{b}^b = [b_1^b, \dots, b_j^b, \dots, b_m^b]$

$$\begin{bmatrix} (1+w_j) \gamma_{11} + (1+w_E) \omega_i A x_j^{*2} & & (1+w_E) \omega_i A x_m^* x_j^* \\ & \dots & \\ (1+w_E) \omega_i A x_m^* x_j^* & & (1+w_j) \gamma_{1m} + (1+w_E) \omega_i A x_m^{*2} \end{bmatrix} \begin{bmatrix} b_1^b \\ \dots \\ b_m^b \end{bmatrix} =$$

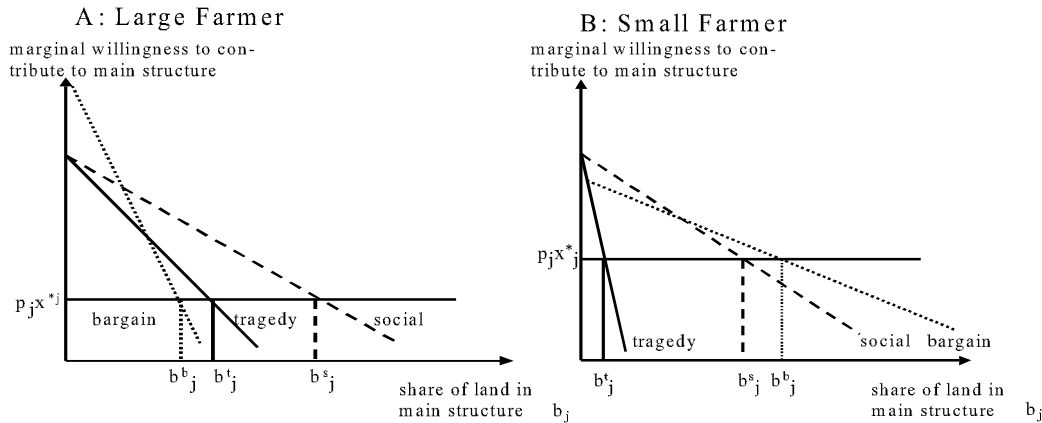
$$= \begin{bmatrix} (1+w_j) [p_j x_j^* - \gamma_{0j} - \gamma_{2j} r_j] + (1+w_E) x_j^* \omega_i \\ \dots \\ (1+w_j) [p_m x_m^* - \gamma_{0m} - \gamma_{2m} r_m] + (1+w_E) x_m^* \omega_i \end{bmatrix} \quad (18b)$$

The left hand side can be expressed with a matrix Γ^* and the right hand side as a vector in "j":

$$\Gamma^* \mathbf{b}^b = (1+w_F) [p - \gamma_0 - \gamma_2 r] + (1+w_E) x \omega_0 \Leftrightarrow \mathbf{b}^b = \Gamma^{*-1} (1+w_F) [p - \gamma_0 - \gamma_2 r] + (1+w_E) x \omega_0 \quad (19)$$

The resulting vector $\mathbf{b}^b$ depicts the bargaining solution, and vice versa the bargain solution reflects the political power structure. If power would be equally distributed, a vector $\mathbf{b}^s$ can be calculated showing a social welfare solution (dropping weights). However, it can be assumed that large farmers have bigger bargaining power than small-scale farmers. Diagram 4 depicts such a situation, where the small scale farmers (right side) are pushed into an "oversupply" of margins while large farmers (left side) may even enjoy a position where their individual bargaining supply function ("bargain") shifts to the left. The diagram assumes that the social situation is not achieved. The social objective function is theoretically achieved, if weights for different pressure groups are equal, a special case. The model can be used to analyse deviations.

Diagram 4: Bargaining solution and modified willingness to contribute after bargaining



Modifications in the Interest Function due to Institutional Amendments

So far, the analysis has been conducted on the presumption that property rights were initially ill-defined and that a partial manager was in charge of regulatory policy on field margins. However, we could imagine that the community may consider institutional amendments to change the influence of particular groups on the manager after experiencing statutory regulations and political lobbying that redistributed rights in terms of regulations. If institutional amendments become possible, the community may seek for more efficient and "justifiable" institutions, distributing costs and benefits. From an economic point of view payments could be installed and providers of the main structure become entitled to payments on the basis of individual contributions. Apparently, this implies a-prior changes of property rights. Vice versa, the beneficiary, i.e. the ecological pressure group maybe willing to accept a payment levied as a tax for public good provision. That levy would lead their constituency still with a surplus.

In principle, if the environmentalist concede to pay, i.e. a certain amount of money $p \cdot B^1$ goes to farmers, interest functions change. Money has to be deducted from environmentalists' surplus, provided as the area below the marginal willingness to pay curve (Diagram 3). Administratively, one can think of a uniform tax to be collected in the community of beneficiaries by the manager. But, the size of B^1 and hence the price is something that has to be decided in political negotiations. Compromising on B^1 , the environmentalists, however, will know that their surplus is smaller. Since they have to trade payments against benefits in the new institutional setting, they will be cautious to share welfare increases with the farmers.

Equally, the farmers will negotiate with the manager on types and sizes of payment. We assume that it is difficult for the manager to check individual costs from farmers; hence, he will look for simple payment criteria. Let's assume the community agrees on paying individual farmers on land shares in the ecological main structure. This would provide them proportional compensation. In addition, we deduct managing costs " c_m ", as unit costs for payments, proportional to the size of the main structure $c \cdot B^1$. Then, individual payment to farm j becomes dependent on the farmers decision to provide a share of land and the total size of the scheme:

$$pay_j = \frac{Ax_j^*b_j}{A\sum_j x_j^*b_j} [pB_j^i - cB_j^i] = x_j^*b_j [p - c] = x_j^*b_j [\omega_0 - \omega_1 B - c_m] \quad (20)$$

The introduction of such payments enables a re-specification of individual interest functions. Note, that now a new distribution of a-prior property rights exists, and the new institution changes the interests and bargaining solution. But, still no benevolent dictator exists. Rather, rewriting the objective function we receive as an amended farmer's interest function:

$$I_j^i = \frac{B[p_j x_j^*(1-b_j) - C(x_j^*(1-b_j), b_j, r)]}{\sum_j x_j^*b_j} + x_j^*b_j [\omega_0 - \omega_1 B - c_m] - c_j, \quad (21)$$

a similar amendment of the environmentalist pressure groups, according to Diagram 3 gives:

$$I_E^i = [\omega_0 - p]B - 0.5 \omega_1 B^2 - c_m B - c_E = 0.5 \omega_1 B^2 - c_m B - c_E, \quad (22)$$

and for the political centre as a manager a new equation (23):

$$I_c^i = \sum_j \frac{B[p_j x_j^*(1-b_j) - C(x_j^*(1-b_j), b_j, r)] + x_j^*b_j [\omega_0 - \omega_1 B - c_m]}{\sum_j x_j^*b_j} + \sum_j s_j(c_j, \delta_j) + 0.5 \omega_1 B^2 + s_E(c_E, \delta_E) - c_m B$$

The benefit of this explicit reformulation has to be seen in its capability to solve again for a bargaining solution, as been done in the previous section. Having obtained the altered objective function, the model can be solved for a new vector $\mathbf{b}^P$. Note that the new $\mathbf{b}^P$ includes payments and implicitly solves for "prices" and "quantities". Then, as special cases we can analyse pure statutory regulations, concerted pricing, and the case of zero transaction cost. However, costs for payment collection and distribution maybe arbitrarily high and statutory regulations are optimal. The improved bargaining solution should show efficiency gains. Deciding on levels of provision of field margins b_j^P , the political process also decides on payments. At least, since payments will encourage farmers, it can be expected that the provision of field margins will increase. However, the distribution of the benefits is still a political problem.

Summary and Outlook

The paper has shown that statutory regulations for the provision of field margins in ecological main structures can be derived from the application of a political economy framework. In this framework, the situation of a benevolent dictator and voluntary provision become special cases. In particular, the result of the bargaining depends on the political power of the regulator relative to the social power of other pressure groups. The model allows us to set up hypotheses in a rigorous way, while providing an analysis of expected bargaining processes in field margin provision assuming a-prior situations unclear property right, so called ill-defined property rights situations. Though the process of bargain reveals the actual a-priori property right situation, amendments such as payments schemes change rights. Moreover, the impact of power and interest can be distinguished and transaction cost elements can be investigated.

The model of political bargaining adopts field margin provision in a spatial framework of rectangular fields, while supplying a framework for agricultural main structure provision. The main structure is treated as a public good and it is shown how farmers'

objective functions for power struggles can be derived from micro-economic theory of constrained farm optimisation. A manager, under political influence, maximises his support function.

However, the structure of the political economy plays a key role in the formulation of statutory regulations and the model can be further extended to explore opportunities for the analysis of constitutional variations. Such variations may be partly monetary transfers between farmers and the public, and would enable the regulator to improve the incentive structure for participation. Moreover, supervision and bargaining costs could be integrated.

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