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ANALYSIS

# Relative importance and determinants of landowners' transaction costs in collaborative wildlife management in Kenya: an empirical analysis

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**Abstract**

Collaborative management of protected areas—which involves state agencies, local communities and other stakeholders—has been identified as a promising approach of organising nature conservation. However, as a complex governance structure, co-management can be expected to involve considerable transaction costs for the participating stakeholders. Empirical studies concerning the quantification of these costs are still scarce. Against this background, this paper empirically analyses the relative importance and the determinants of the landowners' transaction costs arising from collaborative wildlife management, taking two wildlife sanctuaries in Kenya as examples. The empirical data presented in this paper was collected in the wildlife dispersal areas of Shimba Hills National Reserve and Amboseli National Park in Kenya. The results of this study show that—as compared to other cost categories—the landowners' transaction costs incurred in wildlife co-management were relatively low. They also indicate that the magnitude of the transaction costs incurred by landowners is influenced by the attributes of transactions; bio-physical and ecological characteristics of the resource systems; landowners' characteristics such as their human, social and financial forms of capital; losses resulting from human–wildlife conflicts; tenure security and benefits from conservation. Comparing the results of a two-stage least squares regression model of landowners' characteristics of the two wildlife sanctuaries, it was found that the level of significance and the sign of most variables are not the same for both areas. This indicates that it is a specific combination of local factors that influences the transaction costs borne by the landowners.
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## 1. Introduction

In view of a high rate of biodiversity loss in developing countries due to market and government failures (Pearce and Moran, 1994), the

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devolution of responsibility for natural resource management to local organisations has gained increasing importance in recent years. One important management system that has emerged as a consequence of the devolution processes is collaborative management (in short, co-management) in which the state retains a substantial role in resource management, while at the same time the role of the local resource users or landowners is expanded (Meinzen-Dick and Knox, 2001, p. 41). Co-management arrangements shift, to a variable extent, the control, administration and enforcement of agreements from the government to the local communities. Other stakeholders such as NGOs and private agencies are also often included, either as facilitators or as formal partners in collaborative arrangements. The shift of responsibility can greatly contribute to the solution of management problems that arise from conflicting interests among the stakeholders involved (Hilhorst and Aarnink, 1999, pp. 11–12).

Transaction costs economics, though initially developed to study economic organisation in the industrial sector, has increasingly been applied in studies on natural resource management (Kuperan et al., 1998; Birner and Wittmer, 2000). Hanna (1995) argued that the ex post transaction costs arising after the establishment of a co-management system are likely to be lower than those in a centralised system due to increased legitimacy, leading to lower costs ensuing from monitoring and enforcement. However, the establishment of a co-management system involves ex ante transaction costs for searching information, co-ordination and bargaining that do not arise in a centralised system. Consequently, co-management increases the efficiency of natural resource management if the ex post savings in transaction costs more than outweigh the increased ex ante costs of establishing a collaborative management system, taking pure time preference into account (compare Hanna, 1995). Kuperan et al. (1998) empirically measured the transaction costs of collaborative fishery management systems and found that they were more efficient than state-managed systems. With this exception, however, empirical studies on the transaction costs of co-management have been scarce.

Following North and Wallis (1994, p. 610) and Williamson (1991), transaction costs and production costs have to be studied simultaneously because it is the total of the production and transaction costs that determines the efficiency of a governance structure if benefits are held constant. So far studies that focused on transaction costs such as Kuperan et al. (1998) did not take into account other cost categories. Studies focusing more generally on efficiency in nature conservation such as Norton-Griffiths (1996), however, tended to neglect transaction costs. Therefore, the question has remained unclear as to how important transaction costs actually are as compared to other costs arising in nature conservation such as the cost of maintaining fences or the cost of guarding farms against damage caused by wildlife. A second issue that is relevant when evaluating co-management systems is the question of who has to bear the transaction costs. In this context it is also relevant to know more about the factors that influence the level of transaction costs that the local community members have to bear. Taking the case of two collaboratively managed community wildlife sanctuaries in Kenya as an empirical example, the present paper deals with these two questions:

1) the relative importance of the landowners' transaction costs as compared to other cost categories, and
2) the factors influencing the transaction costs incurred by individual community members.

Throwing light on these two issues will be useful for a better assessment of co-management approaches, especially with regard to the incentives and disincentives that this system may create for landowners.

The paper is structured as follows: The next section develops the concepts to be used for the empirical analysis. Section 3 gives an overview of the two community wildlife sanctuaries used in the empirical case study and outlines the research methodology applied. Section 4 presents the results concerning the estimated transaction costs

and compares them with other cost categories incurred by the landowners. Section 5 analyses and discusses the factors determining the transaction costs that the landowners incur. Finally, Section 6 draws a number of conclusions.

## 2. Conceptual framework

### 2.1. Distinguishing production costs and transaction costs in wildlife conservation

In order to deal with the first issue identified above, it is necessary to distinguish transaction costs from other categories of costs involved in nature conservation. For reasons of practicality, we will follow the distinction between production costs and transaction costs used in industrial economics (North and Wallis, 1994). Therefore, wildlife conservation is regarded here as the 'production' of wildlife and related benefits such as the maintenance of biological diversity. This 'production process' requires certain institutional arrangements such as changing the property rights for the areas to be protected and various technical measures such as, constructing fences. The costs arising from the technical measures are regarded as production costs, while the costs arising from creating and implementing the institutional arrangements are regarded as transaction costs.

Following this definition, one can subsume the following categories of costs as wildlife conservation production costs (compare Norton-Griffiths, 1996; Emerton, 2001):

1) the opportunity costs of land that is set aside for wildlife conservation;
2) the costs ensuing from the installation and maintenance of the infrastructure such as fences, roads, offices, houses for wildlife wardens, etc., and the maintenance of wildlife;
3) the costs arising from damages to crop and livestock production by wild animals and the costs incurred to prevent such damages.

Concerning the transaction costs, one can distinguish the following three categories (compare Griffin, 1991, p. 602; Kuperan et al., 1998, p. 1; Challen, 2000, p. 29, 39):

1) search and information costs,
2) bargaining and decision or contracting costs, and
3) monitoring, enforcement and compliance costs.

The first two categories of costs occur before the institutional arrangements for collaborative management are made, while the third category occurs afterwards. They are, therefore, also referred to as ex ante costs (investment costs) and ex post costs (operational costs), respectively.

The identification of the factors influencing the level of transaction costs has been a central theme of transaction costs economics since they are crucial for the identification of appropriate governance structures. Conventionally, one can distinguish as influencing factors the attributes of the transactions and the frame conditions or contextual factors. Based on theoretical considerations by Williamson (1991, pp. 281–282) and others (Shelanski and Klein, 1995, p. 337; Birner and Wittmer, 2000, p. 10), one can identify four key attributes of transactions in wildlife co-management:

1) Uncertainty that arises from an uncertain environment and complex activities and usually leads to incomplete contracts.
2) Asset-specificity, which leads to the generation of appropriable quasi-rents.
3) Frequency with which the transactions occur such as, e.g., the frequency of decision-making, meetings, etc.
4) Complexity of the co-management arrangements which mainly arises from the diversity of the stakeholders' interests, lack of social cohesion and the number of resource users or landowners.

The empirical study will make it possible to discuss the relevance of these factors in a qualitative way. A quantitative assessment of these factors would require a larger sample of cases.

Table 1
Management aspects of the wildlife sanctuaries

| | Kimana sanctuary | GM sanctuary |
|---|---|---|
| Legal status | Group Ranch property | Shareholder company |
| Number of landowners who are members | 843 | 127 |
| Ownership status of land | Land communally owned by Group Ranch members | Land owned individually |
| Membership besides landowners | KWS, Africa Safari Club (ASC) and Amboseli/Tsavo Group Ranches Association (all are co-opted members) | KWS, Forest Department, Local County Council, Local Town Council, Travellers Group of Hotels (private agency) and Eden Wildlife Trust (NGO) (all are permanent ex-officio members) |
| Type of management | Before March 2000: local management committee appointed by the Group ranch committee<br>After March 2000: ASC, which has leased the sanctuary | Board consisting of five elected shareholder representatives (ancestral landowners), six permanent ex-officio members and two nominated Cliff Area owners |

### *2.2. Factors influencing the level of the transaction costs incurred by individual community members*

In order to identify the factors influencing the level of the transaction costs incurred by individual community members, it is useful to consider that transaction costs arise (1) from co-ordination activities among the community members and (2) from the interaction (bargaining, etc.) between local communities and state agencies. The transaction costs may differ between households due to household characteristics and due to differences in the willingness of households or the incentives created for them to bear the transaction costs involved in engaging in a co-management regime.

The literature on collective action in natural resource management suggests that the transaction costs arising from co-ordination activities are influenced by the social cohesion, or the social capital of the community members (Ostrom, 1994; Baland and Platteau, 1996). The transaction costs arising from the interaction with state agencies probably depend on the perceived relation between the community members and the state agencies concerned. The incentives for the households to bear transaction costs involved in engaging in a collaborative wildlife management system may depend on the benefits that the household expects from this system. The capacity of the household to spend time and resources for engaging in collaborative management also depends on the available financial capital and the availability of labour in the household. In the empirical application, one also has to take into account the factors that directly influence the transaction costs incurred by the households such as the opportunity costs of labour, age and gender, education level, and land ownership and tenure (Cohen and Uphoff, 1977).

## 3. Study area and methodology

The field study was conducted in two community sanctuaries: the Kimana Community Wildlife Sanctuary (hereafter referred to as Kimana sanctuary) and the Golini–Mwaluganje Community Wildlife Sanctuary (hereafter referred to as GM sanctuary). The two sanctuaries (see their management aspects in Table 1) were purposely selected after carrying out a survey in the four major wildlife dispersal areas in Kenya, i.e. Greater Amboseli, Maasai Mara, Laikipia/Samburu and Tsavo/South Coast. Nine community wildlife sanctuaries were found in these areas. The survey focussed on collecting general information (e.g. year of establishment, number of stakeholders involved, etc.) from the local staff of the Kenyan Wildlife Service (KWS), the leaders of the sanctuaries and the personnel of conservation NGOs. Only two of the nine sanctuaries fulfilled the following two selection criteria. The sanctuaries should already have reached a stage where they

derive cash benefits, and the roles of stakeholders in the management arrangements should be clearly defined in order to make it possible to collect data on the costs incurred by them. In terms of increased wildlife populations and reduction of losses caused by wildlife, Kenyan conservationists consider the selected community sanctuaries to be the most successful cases of community involvement in wildlife conservation and management in the dispersal areas of KWS-managed National Parks and Reserves. This indicates a selection bias which will be taken into consideration when interpreting the results.

### 3.1. Profile of the two community wildlife sanctuaries

Kimana sanctuary is an isolated swampy area (6000 ha) located in the dispersal areas of the Amboseli National Park, while the GM sanctuary is a 10 km long corridor (3600 ha) between two state-managed protected areas (Shimba Hills National Reserve and Mwaluganje Forest Reserve). Agro-ecologically, Kimana sanctuary is located in a lower midland livestock-millet zone with 150–200 mm of rainfall per year. It has, therefore, no potential for rainfed arable production. However, GM area has a medium potential for arable production since it is located in the lowland cashew-nut-cassava zone with 900–1000 mm of rainfall per year (Jaetzold and Schmidt, 1983). Accordingly, the landowners in Kimana are mainly semi-nomadic pastoralists who have co-existed with wildlife for decades. Some of them, however, have been actively involved in irrigated horticulture in recent years. In contrast, the landowners in GM are mainly subsistence farmers who in the 1990s were forced by elephants to abandon their farms.

The current tourism attraction capacity in Kimana is supported by a diversity of wildlife (elephants, giraffes, lions, zebras, wildebeests, etc.) and its proximity to Mt. Kilimanjaro. In GM, elephants are the only group of wildlife that attract tourists. However, their density in this sanctuary is comparatively high (7 elephants per $km^2$, according to Sanctuary records). In addition, tourists' attraction capacity of this sanctuary is provided by its closeness to the coastal beaches.

The landowners who are members of the Kimana sanctuary are a large, well-established and stable group, guided by traditional norms. All the landowners belong to one ethnic group (Maasai) and, thus, are more or less homogeneous. Those who are members of GM are divided into two small groups (Golini and Mwaluganje) which were formed at the beginning of the co-management process. Thus, the landowners there have an unstable organisation without an established power structure. As the landowners in GM consist of two community groups which belong to many different ethnic groups, they are characterised by heterogeneity of interests and culture.

### 3.2. Data collection

The empirical data used in this study was collected from the landowners and other stakeholders, including the co-opted and ex-officio members of the community sanctuaries. To structure the collection of costs' data, the process of establishing the sanctuaries was divided into the investment phase (ex ante) and the operational phase (ex post). In the Kimana case, the investment phase lasted from 1995 to 1996, and in the GM case from 1992 to 1995. Before conducting interviews with the landowners, general information on the activities during this phase (e.g. meeting-places, time, and contents of meetings) was gathered from key informants and verified with other stakeholders who had been involved in the co-management process. Moreover, the recall answers from the respondents were cross-checked for consistency with each other and with the information provided by the key informants.

For the investment phase, data was collected on the total transaction and production costs arising during the entire phase. The operational phase, however, was too long a period for the respondents to recall all of the information for the entire phase. After confirming with the stakeholders that the operational activities had been more or less similar in all the years since the establishment, only data for the activities of the current year was

collected. These costs were then regarded as the average annual costs of the ex post stage.

Data on the time and expenses of the landowners was collected for the two phases through in-depth interviews, based on a detailed semi-structured questionnaire, conducted with a stratified random sample consisting of members and non-members of the two sanctuaries. A total of 136 landowners (70 from Kimana and 66 from GM sanctuary) were interviewed. Even though the total number of the households in Kimana and GM is different, the goal in both cases was to have around 70 respondents in order to be able to analyse the cases individually using regression models. The sampling frame included all the households that contribute land to wildlife conservation, either directly as members of the sanctuaries, or indirectly, because wildlife has inevitable access to their private farms. Households without land were not considered in this study because the preliminary investigations showed that their economic activities have little interaction with wildlife.

To calculate the transaction costs arising for the landowners due to their participation in meetings, the wage rate was multiplied with the reported time spans. This approach is justified by the fact that the landowners in both study areas had the possibility to work outside their farm throughout the year. This indicates that opportunity costs of participation indeed arise throughout the year and that the wage rate can be used as a proxy for these costs. Since the total population of the members and non-members in both study areas is known, the total costs of participation were extrapolated from the costs of the proportion of landowners that had participated.

## 4. Landowners' costs of collaborative wildlife management

Table 2 displays the production and transaction costs incurred by landowners during the entire ex ante stage and the annual costs incurred during the ex post stage. For comparison, Table 2 also shows the costs that were incurred by other stakeholders.

### 4.1. Ex ante costs

As Table 2 shows, in the ex ante stage, both the landowners' production and transaction costs per participating household were higher in GM than in Kimana. The production costs for GM landowners arose mostly from their contribution of labour during the installation of fences, and they were higher than the transaction costs. It was necessary to involve the landowners in the fencing activity because of the uncertainty arising from the fact that the area is characterised by thick forests and the land had not been adjudicated. The landowners in Kimana did not incur production costs at all in the ex ante phase because neither the bio-physical and ecological conditions there nor uncertainty in land allocation necessitated contributions by the local community. This is mainly an asset-specificity issue. As Table 2 shows, the major proportion of the production costs during the investment phase of both sanctuaries—e.g., infrastructure development—were incurred by other stakeholders (mainly state agencies and NGOs).

The transaction costs incurred by the landowners in the ex ante phase were mainly caused by their participation in the gathering of information and in negotiations. The transaction costs in the GM sanctuary are higher than those in Kimana because of the complexity involved in organising the landowners in GM. As indicated above, this complexity was due to the fact that the landowners there did not have an already established organisation similar to that of the Kimana Group Ranch. Therefore, it was more expensive to negotiate with them. They had to be involved as individuals, whereas in Kimana, the KWS negotiated with the leaders of the already established Group Ranch. Moreover, unlike the landowners in Kimana, the landowners in GM are heterogeneous and have different cultural backgrounds, household characteristics and economic interests which make organisation and negotiations more difficult. In addition, more transaction costs had to be incurred in GM in the ex ante phase in order to identify the genuine landowners who were later to be registered as members of the sanctuary. In Kimana, the members of the Group Ranch, who

Table 2
Landowners' and other stakeholders' production and transaction costs of co-management (per participating household[a])

| | Ex ante stage | | Ex post stage[b] | |
|---|---|---|---|---|
| | Production costs in US$ | Transaction costs in US$ | Production costs in US$ | Transaction costs in US$ |
| Kimana landowners | 0 | 11 | 27 | 20 |
| Other Kimana stakeholders | 19 | 13 | 17 | 0 |
| Total for Kimana | 19 | 24 | 44 | 20 |
| GM landowners | 31 | 18 | 12 | 9 |
| Other GM stakeholders | 423 | 166 | 140 | 11 |
| Total for GM | 454 | 184 | 153 | 20 |

[a] Only the estimated total number of participating households is considered (1302 in Kimana and 664 in GM). Participating landowners or households are those that were involved in any of the activities (mostly meetings, training and tours) during the creation and operation of the sanctuaries. This definition excludes involvement in production activities such as fence maintenance.

[b] Since direct management costs are shared by all of the stakeholders, they are not included in this table. Mburu and Birner (2002) found that these costs were US$ 32 per participating household in Kimana and US$ 48 in GM. Costs that would also accrue to landowners even in the absence of sanctuaries (e.g. guarding costs, losses of crops and livestock, land opportunity costs) are also not included. These latter costs are shown in Table 3.

were already known, were destined to be the sanctuary members.

### 4.2. Ex post costs

In the ex post phase, the magnitude of the landowners' production costs in both sanctuaries is influenced by the bio-physical, ecological and technological factors. However, these costs also depend to some extent on the kind of co-management arrangements established as a result of negotiations. For example, the production costs at the Kimana sanctuary are lower than those at the GM because the landowners in Kimana have to maintain by themselves a comparatively long fence (61 km) that encloses two areas inhabited by landowners. In GM, the fence, which divides the wildlife corridor from the farms, is only 10 km long. Moreover, its maintenance is also supported by another stakeholder, the Eden Wildlife Trust.

The sanctuaries' transaction costs during the ex post stage arise due to management activities (meetings), monitoring, conflict resolution and enforcement of contracts. These costs are, therefore, largely influenced by the characteristics of the landowners and their organisation as well as the respective co-management arrangements. The results in Table 2 show that the landowners' transaction costs arising during the ex post stage are in both cases lower than the production costs. Though the total transaction costs arising for all of the stakeholders are almost of the same magnitude in both sanctuaries, those accruing to the landowners only are lower in GM than in Kimana (compare Tables 2 and 3). This can be explained by differences in the management arrangements between both sanctuaries. The sanctuary members in Kimana have to make management decisions, handle conflicts and ensure compliance to the agreements by themselves, while the role of other stakeholders is only advisory. Moreover, the types of problems the sanctuary faces do not necessitate direct involvement of other stakeholders. For example, a major problem in Kimana during the ex post phase has been that the leaders of the Group Ranch do not distribute the revenues equally (see also Section 5.1). Since this is a problem within the landowners' organisation, it raises the transaction costs of the landowners because they are involved in contesting for their right to benefit from the tourism revenues. In GM, the management arrangements are organised such that all of the stakeholders co-operate as equal partners in decision-making. This makes the involvement of other stakeholders necessary and they, therefore, incur transaction costs during the

Table 3
Comparison of landowners' total transaction costs and other cost categories (per participating household[a])

| | Costs before establishment of the sanctuaries in US$ | | Costs after establishment of the sanctuaries in US$ | | Distribution among the stakeholders |
|---|---|---|---|---|---|
| | Kimana | GM | Kimana | GM | |
| Fence maintenance | Nil | Nil | 27 | 12 | Landowners |
| Guarding farms | 156 | 390 | 109 | 351 | Landowners |
| Crops and livestock losses | 30 | 20 | 15 | 8 | Landowners |
| Opportunity costs of land use[b] | – | – | 317 | 668 | Landowners |
| Total transaction costs | Not measured | Not measured | 20.2 | 19.8 | Kimana: mainly landowners; GM: landowners and other stakeholders |

[a] For the definition of participating households, see footnote a in Table 2.
[b] Data on opportunity costs of land use is adapted from Mwau (1995).

ex post phase. Furthermore, since the GM landowners do not have an already established local organisation comparable to that of the Kimana Group Ranch, the other stakeholders are willing to share transaction costs as they assist the landowners in tackling the problems experienced in the sanctuary. Moreover, the nature of the problems in GM sanctuary in the ex post phase, e.g. the low level of benefits and non-compliance of certain groups of landowners, demand that all the stakeholders be involved.

Table 3 shows that the landowners in both sanctuaries continue to incur other production costs, especially for guarding the farms and losses of crops and livestock. These two categories of costs are borne exclusively by the landowners. Though electrical fencing has slightly reduced these costs, the landowners would still incur them in the absence of the sanctuaries. If all of these production costs for the landowners are taken into account, the transaction costs in these sanctuaries cannot be considered to be a major category of costs that would influence management efficiency (compare Mburu and Birner, 2002). As shown in Table 3, the total transaction costs in both sanctuaries are low in comparison to the total of the other cost categories (production costs). In Kimana sanctuary, e.g., they are lower than the costs arising from a single production activity such as fence maintenance or guarding the farms.

The question arises as to whether the finding that the transaction costs are comparatively low is influenced by the selection bias mentioned in Section 3. As will be shown in Section 5.2, there is no reason to assume that the success of the two sanctuaries is associated with low transaction costs. To the contrary, if benefits from participation are equally distributed, landowners are willing to bear more transaction costs.

One can conclude from Table 2 that the NGOs and state agencies mainly subsidised the establishment of the sanctuaries. In Kimana the transaction costs arising in the ex post phase are almost exclusively incurred by the landowners, and the contribution of other stakeholders to the production costs is also relatively low. This is important with regard to the sustainability of this sanctuary because its operation is not dependent on external funding. The GM case, however, is different in this regard. Though the contribution of the landowners and the stakeholders to the transaction costs in the ex post phase is almost equal, the production costs borne by other stakeholders are about 12 times higher than those of the landowners. This implies that the landowners may not be able to continue to operate this sanctuary if the conservation agencies withdraw their assistance.

A financial cost–benefit analysis of the two sanctuaries showed that they were not financially viable from the landowners' perspective (Mburu and Birner, 2002). This leads to the question as to

why the landowners nevertheless agreed to the establishment of the sanctuaries. One reason is that in addition to being given the right to benefit from wildlife they were assured of retaining ownership of their ancestral land. Another reason is the provision of intangible benefits such as reduced human losses from wildlife attacks. These findings are congruent with Bond's (2001) hypothesis that institutional change in natural resource management can be driven both by proprietorship in the resources as well as by the benefits derived from their protection.

## 5. The econometric model and its results

Based on the theoretical considerations in Section 2, we developed an econometric model in this section in order to identify the influence of different factors on the transaction costs incurred by the landowners. As outlined in Section 2, the magnitude of the landowners' participation costs is hypothesised to be linked to deriving benefits from wildlife conservation and important characteristics of the landowners such as wealth status, social capital, etc. In the discussion that follows in this section, the sign of each variable is marked with a (+) or (−) to show whether it has, according to the hypotheses, a positive or negative influence on the transaction costs incurred by the landowners (see the meaning of the variables in Table 4).

Due to the potential simultaneity bias that would arise in an ordinary least squares (OLS) regression as a result of inclusion of the endogenous BENEFIT variable (a dummy that equals one if landowners have been deriving benefits from wildlife conservation), the 'treatment effect model' (Greene, 1998) has been applied. This model overcomes the problem of coming up with inconsistent estimates if OLS is used when one of the right-sided variables is endogenous. It is specified as:

$$y = \alpha_1 + \beta_1 x + \delta_1 z + E_1 \quad (1)$$

$$z^{\cdot} = \alpha_2 + \beta_2 v + E_2 \quad (2)$$

$z = 1$ if $z^{\cdot} > 0$ and $z = 0$ if otherwise.

In this case, $y$, the magnitude of the landowners' total participation costs (in both ex ante and ex post stages) is a function of the exogenous variables represented by $x$ and the endogenous variable $z$ ($\alpha$ is a constant; $\beta$ and $\delta$ are the estimated regression coefficients and $E_1$ and $E_2$ are error terms). The model is estimated through a two-stage least squares regression, using as the instrumental variable for $z$ the probit maximum likelihood estimates from Eq. (2). Descriptive statistics of the variables used in the econometric model are shown in Table 5. The model was run separately for each sanctuary (see results in Table 6). For brevity, our discussion in this section concentrates on the variables determining the level of transaction costs borne by the landowners. Thus, only some key variables are mentioned that influence whether landowners derive benefits from wildlife conservation.

### 5.1. Factors determining whether landowners derive benefits from wildlife conservation

Cash revenue collected from the sanctuaries is the major form in which the members derive benefits from the sanctuaries. Though the level of these cash benefits is low (Mburu and Birner, 2002), only the leadership of the GM sanctuary distributes them fairly among its landowners. In Kimana, the cash revenues are withheld by the Group Ranch committee, which may allocate them without the consent of the group members to common projects or take care of emergency needs (e.g. hospital bills) of some of the members. In addition, both members and non-members of both sanctuaries benefit from school bursaries and infrastructure investments in education, health and other facilities which donor organisations provide as incentives to promote wildlife conservation. As the results in Table 6 show, the educational level is the only factor that is significant and positively linked to the deriving of benefits in both sanctuaries. This factor is probably so important because it not only enables the landowners to negotiate for benefits but also provides them with the ability to recognise a wider range of benefits arising from wildlife co-management. Other key factors that are positively linked to receiving benefits include

Table 4
Variables included in the econometric model

| Variable | Meaning |
|---|---|
| *Dependent variable* | |
| TOT_TC | Landowners' total costs (Ksh./household head) in both stages of the co-management process |
| *Explanatory variables* | |
| (A) Demographic characteristics and human capital of the landowners | |
| AGE | Age of the household head in years |
| SQAGE | Quadratic specification for age |
| HEADMALE | Dummy variable = 1 if the household is male headed and = 0 if female headed |
| CH_15HHTOT | Ratio of children below 15 years of age to the total household size |
| MWA_GOLI | GM: dummy variable = 1 if the household is located in Golini and = 0 if Mwaluganje |
| EDULEVEL | Level of education of the household head in years |
| (B) Financial capital and tenure security of the household | |
| TENURE | Dummy variable = 1 if the household has land with a title deed, otherwise = 0 |
| TOTLIV_U | Total livestock units of the household |
| (C) Social capital of the household | |
| RELIGION | Kimana: dummy variable = 1 if the household belongs to the protestant or catholic religion and = 0 if traditional religion |
| LOGRONOS | The number of local groups (e.g. women groups) in which the household is an active member |
| CLAN | Kimana: dummy variable = 1 if the household belongs to the Ilmolelian clan (biggest clan), otherwise = 0; GM = 1 if Mukinamboza and Mukinangandi clans (two biggest clans), otherwise = 0 |
| ETHNIC | GM: dummy variable = 1 if the household belongs to Digo (largest tribe), otherwise = 0 |
| (D) Farming system and damages incurred by the household due to wildlife | |
| TOTLOSS | Annual total loss in Ksh. incurred by the household as a result of wildlife attacks |
| FARMCUL | Cultivated area of land in acres |
| (E) Relation between household and state agencies | |
| KWSREL | Dummy variable = 1 if the relationship with the conservation state agency is perceived as good and = 0 if bad |
| (F) Drawing benefits from wildlife conservation | |
| BENEFIT | Dummy variable = 1 if the household has benefited from wildlife in any way including receiving cash from the sanctuaries, otherwise = 0 |

TOTLIV_U (an indicator of a household's financial capital) and CLAN affiliation in Kimana, and MWA_GOLI (location of landowners), TENURE security and FARMCUL (area of farm cultivated) in GM. Although they are not significant, TOTLIV_U and RELKWS (relationship with state agency) in GM and C15_HHTOT (a measure of household dependency ratio) in Kimana are also important variables that are positively linked to the receiving of benefits. Unlike in Kimana, the variable CLAN in GM is significant at 5% level, but negative. This result is important since in this sanctuary (GM) no benefits of association (socio-cultural, economic, etc.) are derived from clan membership, while in Kimana belonging to certain clans and particularly the large ones is associated with better grazing rights, political strength, leadership in community activities, etc.

Table 5
Descriptive statistics of variables used in the regression model

| Variable | Kimana ($n = 70$) | | GM ($n = 66$) | |
|---|---|---|---|---|
| | Mean | Standard deviation | Mean | Standard deviation |
| TOT_TC | 1331.69 | 1871.26 | 1483.20 | 1214.73 |
| AGE | 45.09 | 14.58 | 49.82 | 13.42 |
| SQAGE | 2242.20 | 1428.33 | 2659.27 | 1389.91 |
| HEADMALE | 0.91 | 0.28 | 0.89 | 0.31 |
| CH_15HHTOT | 0.72 | 1.01 | 0.36 | 0.26 |
| MWA_GOLI | – | – | 0.48 | 0.50 |
| EDULEVEL | 4.39 | 4.41 | 4.65 | 4.79 |
| TENURE | 0.63 | 0.49 | 0.74 | 0.44 |
| TOTLIV_U | 20.19 | 36.63 | 2.31 | 6.19 |
| RELIGION | 0.83 | 0.38 | – | – |
| LOGRONOS | 0.66 | 0.81 | 0.14 | 0.49 |
| CLAN | 0.37 | 0.49 | 0.38 | 0.49 |
| ETHNIC | – | – | 0.68 | 0.47 |
| TOTLOSS | 1165.45 | 2426.51 | 619.08 | 964.15 |
| FARMCUL | 3.13 | 6.06 | 3.97 | 4.04 |
| KWSREL | 0.84 | 0.37 | 0.59 | 0.49 |
| BENEFIT | 0.29 | 0.46 | 0.71 | 0.46 |

Table 6
Determinants of drawing benefits and magnitude of landowners' transaction costs

| Explanatory variables | Kimana ($n = 70$) | | GM ($n = 66$) | |
|---|---|---|---|---|
| | Deriving benefits | Level of transaction costs (TOT_TC) | Deriving benefits | Level of transaction costs (TOT_TC) |
| Constant | −4.9953* | −4724.6943* | −1.6203 | −277.8695 |
| AGE | 0.1185 | 160.8802** | −0.0208 | −2.6328 |
| SQAGE | −0.0008 | −1.4673** | 0.0003 | −0.1083 |
| HEADMALE | – | 256.8716 | −1.7950** | 620.6303 |
| CH_15HHTOT | 0.3301 | – | −0.0863 | – |
| MWA_GOLI | – | – | 2.0318*** | – |
| EDULEVEL | 0.0921** | 210.9874*** | 0.2325*** | −31.1500 |
| TENURE | 0.3829 | 1520.4463* | 1.6397** | 299.5383 |
| TOTLIV_U | 0.0125** | 4.6133 | 0.4805 | 35.5701 |
| RELIGION | – | 535.1820 | – | – |
| LOGRONOS | – | −320.3448 | −0.3270 | 703.2637*** |
| CLAN | 0.7852** | 922.9459** | −1.6786* | 616.1883** |
| ETHNIC | – | – | 0.0610 | −429.6426 |
| TOTLOSS | – | −0.1218 | – | 0.2981* |
| FARMCUL | −0.0705 | – | 0.3806* | – |
| KWSREL | −0.5433 | – | 0.5430 | – |
| BENEFIT | – | −993.9177 | – | 1552.3518*** |
| Adjusted $R^2$ | 0.149 | 0.329 | 0.201 | 0.395 |

*, ** and *** significant at 5, 10 and 1%, respectively. *Kimana:* log likelihood = −29.47, $\chi^2 = 19.04$, significance level = 0.0248; *GM:* log likelihood = −20.93, $\chi^2 = 36.6$, significance level = 0.00046.

### 5.2. Determinants of the magnitude of transaction costs borne by the landowners

AGE and EDULEVEL are human capital indicators that are important in facilitating negotiations, bargaining and resolving conflicts in the co-management process (+). We hypothesise that landowners with a higher level of human capital also incur higher costs as they participate. These variables are both significant and have the expected positive sign in Kimana. However, the results of GM do not support our hypothesis since both variables are not significant and have a negative sign. Notably, the SQAGE (square of age) in Kimana is significant and negative since the probability of incurring transaction costs increases with age, but at a decreasing margin. As expected, the AGE variable in Kimana positively influences the level of transaction costs since the social set-up there, unlike that in GM, acknowledges the leading role of village elders in the governance of community activities, the enforcement of norms and the resolution of conflicts. The EDULEVEL variable does not have the same influence in Kimana and GM because of the different patterns and motivations leading to the landowners' participation in the two areas. In GM, the marginal mean of time of participation is highest during the negotiation phase, which involved all kinds of landowners in order to sort out the land ownership problem. In Kimana, this measure is highest in the operational phase due to the problem of the distribution of cash benefits.

In both research areas, the total number of livestock units (TOTLIV_U) is an important indicator of wealth or financial capital. It is hypothesised that with rising wealth, the landowners can set aside more time for meetings and are in a better position to meet the travel and incident expenses (+). Though not significant, the factor has the expected positive sign in both sanctuaries.

The TOTLOSS factor, (total loss caused by wildlife in monetary terms) measures whether landowners are motivated to incur participation costs in order to reduce losses from human–wildlife conflicts in their areas (+). In GM sanctuary, the coefficient of this factor is significant at a 5% probability level and has the expected positive sign. However, it has a negative sign in Kimana since the landowners who participate in most of the activities are Maasai pastoralists who co-exist with wildlife without incurring heavy losses due to their local knowledge.

The number of local groups in which landowners are active members (LOGRONOS) and religion (RELIGIO), clan (CLAN), and ethnic group (ETHNIC) affiliations are measures of social capital in this analysis (+). Since the last three are dummies specific to each research area, the LOGRONOS is the only social capital indicator tested in the same way in both sanctuaries (Table 4). The results show that in GM, the coefficient of this variable is significant at a 1% probability level and has the expected positive sign. However, it is not significant and has an unexpected negative sign in Kimana, since, unlike other ethnic groups in this area, only a few Maasai pastoralists participate in the local groups' activities.

Since in both sanctuaries the coefficient of the CLAN variable is significant at a 10% probability level and positive, we can infer that the magnitude of transaction costs incurred by the landowners is linked to affiliations in the two large clans (Mukinamboza and Mukinangandi) in GM and the Ilmolelian clan in Kimana. With respect to GM, this is a surprising result since, as discussed earlier, affiliation to certain clans is not regarded important by the GM landowners and, thus, there is no recognised clan leadership. However, in Kimana, clan leaders are quite influential among the Maasai community.

The ETHNIC variable is a dummy that equals one if landowners in GM belong to the biggest tribe (Digo). Since the coefficient of this variable is negative, the level of transaction costs cannot be linked to affiliation to this tribe. However, this variable was not tested in Kimana because of multicollinearity. Nevertheless, it is important to note that the majority of the landowners in Kimana belong to one main large ethnic group (Maasai). It would be easier for such landowners to attain social cohesion faster and, therefore, the ex ante transaction costs would be lower (Baland and Platteau, 1996).

Following Cohen and Uphoff (1977), we hypothesise that those landowners with more TENURE security would be more motivated to participate and, thus, incur higher transaction costs (+). As expected, the coefficient of this factor is significant (at a 5% probability level) and positive in Kimana. Though not significant, the variable is also positively linked to the magnitude of the landowners' transaction costs in GM sanctuary.

With regard to gender (represented by HEADMALE dummy), one can assume that female-headed households are less likely to participate in co-management activities due to time constraints. We, therefore, hypothesise that the variable would have a positive sign (+), indicating that more men than women participate and incur transaction costs. Though the coefficient of this variable is not significant in both sanctuaries, its positive sign supports this hypothesis.

Concerning the BENEFIT variable, we postulate that it acts as an incentive for participation (+). The results show that in GM the coefficient of this variable is significant at a 1% probability level and positive as hypothesised. The robust results of this factor implies that the benefits arising from GM, particularly cash, are a considerable source of motivation for the landowners to incur costs while participating. This result supports the argument in the literature that landowners are more willing to invest their resources in wildlife conservation if they derive cash benefits (IIED, 1994). On the other hand, the result for Kimana does not support our hypothesis. The coefficient of this variable is not significant, and the negative sign indicates that the non-benefiting landowners even tend to bear higher transaction costs. This result can be explained by the fact that cash benefits in Kimana are not fairly and equally distributed to the landowners. As qualitative information collected during the survey confirmed, the non-benefiting landowners bear transaction costs in attempts to achieve access to cash and other benefits that are withheld and unequally distributed by the Group Ranch committee.

## 6. Conclusions

The analysis of the landowners' transaction costs in this paper shows that these costs do not necessarily constitute the major cost category in co-managed wildlife sanctuaries. Wildlife management often involves considerable costs for activities such as fencing and guarding of farms in order to avoid damages caused by wildlife as well as losses of crops and livestock. These costs have to be regarded as production costs rather than transaction costs arising from wildlife conservation.

Our analysis helped to identify factors that can influence the landowners' transaction costs ensuing from establishing and operating co-management arrangements. They include the attributes of the transactions, bio-physical and ecological (resource) factors, community organisational conditions, the co-management arrangements resulting from the negotiations and the characteristics of the landowners. The landowners' characteristics include deriving benefits from conservation, human, social and financial capital, losses from human–wildlife conflicts and land tenure conditions. Our comparison of two wildlife sanctuaries shows that whether or not these factors are significant depends on the local conditions. The same factors can even have the opposite effect in different cases. Deriving benefits, e.g., was only an incentive for participation in GM where the cash benefits were fairly distributed. In Kimana, where the benefits were not fairly distributed, the non-benefiting members tended to spend more transaction costs to contest for their rights, even though this effect was not statistically significant. Age as an indicator of human capital only had a significant positive influence on the willingness to bear transaction costs in Kimana where community members have an already established power structure and the leadership by the elderly was recognised. Losses from wildlife attacks had a highly significant influence on transaction costs in GM where conservation interests conflict with the interests of the landowners to continue to practice their crop farming systems. Active membership in local groups, which is an indicator of social capital, only had a significant influence in GM where groups

play an important role. Clan ownership as a measure of social capital was the only variable, which in both cases had a significant positive influence on the amount of transaction costs the landowners were willing to bear.

Looking at this differentiated picture, two issues appear promising with respect to future research on transaction costs. More empirical research covering a wider range of cases will help to improve the understanding of the specific interactions between local factors that influence the transaction costs borne by landowners. Such empirical research will also help to develop a more generalised theory of transaction costs, thus making it possible to derive predictions on the interaction of the diverse factors influencing the transaction costs borne by the landowners.

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