Determinants of collective marketing performance: Evidence from Kenya`s coffee cooperatives

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Abstract:

This article investigates the determinants and impacts of free-riding using the example of coffee cooperatives in Kenya. Since the liberalization of the Kenyan coffee sector, private sector engagement throughout the coffee value chain has expanded, exposing coffee marketing cooperatives to increased competition. As a result marketing performance becomes increasingly relevant for evaluating the success of coffee cooperatives. Employing an instrumental variable approach this paper analyzes the link between free-riding and collective marketing performance of Kenyan coffee cooperatives. The econometric analysis is based on original survey data from 120 cooperatives in Eastern and Central Kenya. Results show that free-riding is prevalent and determined by multiple factors related to group characteristics, institutional arrangements and the external environment. Furthermore, we find that free-riding significantly impairs the marketing performance of Kenyan coffee cooperatives.

Keywords: collective action, free-riding, coffee cooperatives, Kenya

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1 Introduction

Smallholders in developing countries face numerous constraints due to the pervasive imperfections of markets. Increasing evidence shows that through collective action smallholders can reduce transaction costs of accessing input and output markets, adopt efficiency-increasing and value-adding technologies, and tap into high-value markets associated with certification and labeling (Kersting and Wollni, 2012; Wollni and Zeller, 2007; Gruere et al., 2009; Devaux et al., 2009; Narrod et al., 2009). Additionally, collective marketing can lead to improved bargaining power in negotiations with buyers and intermediaries (Markelova et al., 2009; Stockbridge et al., 2003).

Notwithstanding these potential advantages, collective action has often failed in practice. This has been most extensively studied in the context of the collective management of common pool resources (CPR). Introducing the concept of the `tragedy of the commons´, Hardin (1968) showed how individually rational behavior accounting only for private costs and benefits leads to the over-use of CPR and thus to a pareto-inferior outcome. Later studies have shown that under certain conditions collective management of CPR can lead to a socially optimal outcome, which can be superior to the state or privately controlled allocation of resources (Ostrom, 1990; Baland and Platteau, 1996). Similarly, collective action problems can emerge in agricultural cooperatives and producer groups, if group members free-ride on the contributions of others. According to Meinzen-Dick et al. (2004) the failure of early community-based development programs can be partly attributed to the lack of understanding of the processes and factors underlying successful collective action (Meinzen-Dick et al., 2004).

While many empirical studies have found a positive impact of collective action on farmers' market access and incomes in developing countries (Barham and Chitemi, 2009; Fischer and Qaim, 2012; Bernard and Spielman, 2009) , few studies have opened the black box of collective action investigating the factors determining the success or failure of collective action initiatives. A challenge associated with such an approach is the definition of the nature of collective action and the operationalization of its measurement. In line with this, Araral (2009) finds that many empirical studies do not measure or specify the nature of free-riding, but have an intrinsic understanding of collective action (collective action lasts over time). In our analysis we strive to address this issue by incorporating a measure that is based on a qualitative assessment of the extent of free-riding in Kenyan coffee cooperatives.

Previous work has identified three broad categories of factors that influence collective action in the context of smallholder market access. These comprise (1) the characteristics of the group, (2) the institutional arrangements that govern the collective action initiative, and (3) the external environment

(Agrawal, 2001). However, there is limited quantitative evidence and little agreement on the direction, size, and significance of the effects of these factors on collective action (Agrawal, 2001; Araral, 2009). Our study provides a quantitative analysis of the determinants of free-riding using a sample of Kenyan coffee cooperatives. We add to the current literature not only by explicitly investigating the factors associated with free-riding, but also by evaluating the impact of the extent of free-riding on collective marketing performance.

The remainder of this paper is structured as follows. In the next section, we provide some background information on the Kenyan coffee sector and coffee cooperatives. This is followed by a description of the conceptual framework in section 3. Section 4 gives details on the data collection, while Section 5 presents the measurement of the dependent and independent variables. In section 6 we present and discuss results of the econometric analyses on the determinants of free-riding and on collective marketing performance, respectively. The last section concludes.

2 Background: Coffee cooperatives in Kenya

Since its introduction as a cash crop in the early 1900s, coffee has traditionally been the backbone of Kenya's highland economy. Until the global coffee crisis in 1933, when Brazil released its surpluses onto the world market and prices plummeted, coffee was grown exclusively by European settlers around Nairobi. Starting from Kisii and Meru districts, smallholders were allowed to produce coffee on an experimental basis. In 1944, smallholders were required by law to join local cooperatives run by the government. The growth of the smallholder coffee sector was accompanied by the exclusive control over production and marketing by the Coffee Board of Kenya (CBK) and the Coffee Marketing Board (CMB) (Hyde, 2008). Since 1987/88, when a record production of 129,000 MT of clean coffee was reached, coffee production in Kenya has been declining (Karanja and Nyoro, 2002). In the 2000's the coffee sector produced on average 50,379 MT of clean coffee per year; indicating a decline of 36% compared to the average production of the previous decade. The decline is most pronounced in the smallholder sector. While the average production of the smallholder sector decreased by 41% during the last decade, the average production of estates declined by 29% in the same period (Ministry of Agriculture, 2010). The weak performance of Kenya's coffee sector, characterized by comparatively low national coffee production and coffee yields in the last two decades cannot be explained by low world market prices in the early 2000's alone, since Kenyan coffee consistently fetches premium prices in international coffee markets. This suggests that additional circumstances specific to the Kenyan coffee sector contribute to low levels of coffee production and productivity.

Since the early 1990s, the liberalization of the Kenyan coffee sector has fundamentally altered the structure of the coffee value chain. Beyond the dismantling of the monopoly power of the Coffee

Board of Kenya as a marketing agent, it also led to the removal of all policy-making jurisdictions over the economic activities of cooperatives. On the one hand, the reforms encouraged farmer and private sector participation through the reduction of government involvement in the coffee sector. Processing costs and statutory deductions especially at the milling and marketing stages decreased substantially due to increasing competition in the coffee value chain. On the other hand, problems of corruption, political opportunism, and mismanagement have been reported to rise across all institutions in the coffee sector, especially in coffee cooperatives (Karanja and Nyoro, 2002; Mude, 2007). Yet, up until now a systematic analysis of free-riding in Kenyan coffee cooperatives and of the implications for collective marketing performance is lacking.

Overall, there are around 600,000 smallholder coffee farmers[i] in Kenya. Smallholders are legally bound to deliver their coffee cherries to cooperatively owned factories for primary processing (Ministry of Agriculture, 2010). Each cooperative runs one or more factories within a certain catchment area defined by natural borders, political boundaries and/or generally accepted informal boundaries. Coffee farmers within a catchment area hold shares of the cooperative's capital and are thereby obliged to deliver their coffee to the factories of that particular cooperative. Primary processing at the factory level, known as wet processing, involves the sorting of coffee cherries, pulping, fermentation, drying and storage. The parchment coffee is marketed collectively either at the cooperative or factory level. The coffee produce at each factory or cooperative is pooled together so that each farmer's contribution is not discernable from the others. The calculation of the final payment is based on the revenue received from coffee sales. The cooperative management deducts then all of its operating costs, including maintenance and service expenses, loan repayments and salaries. The final payment can either be done at cooperative level or factory level. The second method allows for inter-factory, intra-cooperative price variation. Besides primary processing, cooperatives provide inputs as well as education and extension services to their members.

3 Conceptual framework

The conceptual framework underlying this study builds upon the structure-conduct-performance framework developed by Bain (1959). While this approach has commonly been applied to the analysis of market chains (Kruijssen et al. 2009; Porter and Scully, 1986), Meinzen-Dick et al. (2004) propose it as an analytical framework to analyze collective action. As mentioned above, collective action is mainly treated as a black box and 'definitions are usually loose and rooted in other concepts that are not clearly defined' (Meinzen-Dick et al., 2004, p. 198). Most research on collective action does not specify the nature of collective action, nor does it measure the net benefits or impacts of collective action (Araral, 2009). Following Meinzen-Dick et al. (2004), we assume that the structure of a group determines the conduct within the group, i.e., the existence and extent of free-riding among group members. We further assume that the extent of free-riding or cooperation influences the collective

action outcome, i.e. the performance of the group. Feedback loops in the structure-conduct-performance approach emphasize the dynamic nature of the concept of collective action.

The current debate about the factors that determine collective action, regardless of the discipline, is based on the works of Wade (1998), Ostrom (1990), and Baland and Platteau (1996). Considering these key sources, Agrawal (2001) distinguishes between four broad categories of variables that facilitate or impede collective action including resource system characteristics, group characteristics, institutional arrangements, and the external environment. Similar to Markelova et al. (2009), we account in the following for the last three categories given that these aspects are of particular relevance for collective action in the context of smallholder market access.

Group characteristics

With respect to group characteristics, the size, age, origin and social capital of the cooperative have been linked to collective action.

The group size effect on collective action is, according to Poteete and Ostrom (2004), a controversial and complex issue. Group theory suggests that, with increasing group size, collective action becomes more difficult. Olson (1965), who has highly influenced this debate, examines that in a situation where the number of individuals is quite small, coercion or other special devices to make individuals act in the common interests exist, self-interested individuals act to achieve a common goal. As the group size increases, individuals assume that the marginal contribution does not affect the likelihood of the provision of the good. Hence, they contribute only little. However, there is no consensus in the collective action literature on the definition of a small or large group and 'the role of context in mediating the effects of group size' (Araral 2009). Literature based on empirical analyses outlines the controversial debate about the effect of group size on collective action. Araral (2009) shows, that group size negatively affects collective action in the case of collective irrigation management in the Philippines. However, Meinzen-Dick et al. (1997) examine that judgments on the effects of group size must take into account a trade-off between economies of scale and transaction costs. While increased group size positively affects economics of scale (see, Stringfellow et al., 1997), it leads to increased transaction costs, due to reduced observability of members' actions resulting in higher monitoring costs (see, Coulter et al., 1999). Barham and Chitemi (2009) outline that group size does not have any effect on group marketing performance in the case of farmer groups in Tanzania.

The age of the group is often used as a proxy for experience-based trust. According to Meinzen-Dick et al. (1997), individuals in older groups know what to expect from other group members because they have already built collective cognition associated with shared norms and values. In contrast, members of newer groups face greater uncertainty of whether internal cooperation will be reciprocated. However, empirical evidence on the effect of group age is mixed. Fujiie et al. (2005), e.g., find that the

age of irrigation groups is positively associated with collective action, while Ternstrom (2003) finds that the age of the user group has no significant impact on the level of collective action.

Similarly, the origin of the cooperative, i.e., whether it is farmer-founded or externally initiated, is closely linked to the existence of shared norms and social capital (Markelova et al., 2009). In farmer-founded groups strong kinship and neighborhood ties may contribute to cohesive groups, even if members are heterogeneous with respect to the distribution of economic and political power. In contrast, in externally initiated groups the introduced principles of democracy and traceability may conflict with the legitimacy of traditional leadership and decision-making and thus lead to the breakdown of collective action (Stockbridge et al., 2003).

Growing empirical evidence shows that social capital, defined as institutions, relationships, values and attitudes that regulate interactions among individuals (Grootaert and van Bastelaer, 2001), can significantly contribute to development (see, Krishna and Uphoff, 1999; Fafchamps and Minten, 1999; Reid and Salmen, 2000; Isham and Kähkönen, 2000; Rose, 1998; Bebbington et al., 2006; Wambugu et al., 2010). Two main mechanisms link social capital aspects to collective action. Firstly, social capital is closely associated with internal cohesion, which is characterized by a common sense of purpose and accountability fostered by shared norms and values. Secondly, the mechanism of reciprocity links social capital with free-riding. In other words, in order to maintain their reputation and to increase the likelihood of receiving help from someone else, individuals in a close–knit social context avoid opportunistic behavior (Collier, 1998). So far, no consensus about the best proxy indicators for social capital exists. Rather, the relevant indicators have to be identified contextually (Grotaert and van Bastelaer, 2001). The Social Capital Initiative of the World Bank suggests that structural social capital, defined as social networks and other social structures supplemented by rules, procedures and precedents is captured by counting the associations and their members, and collecting information on the aspects of membership and institutional functioning (Uphoff, 2000). With respect to aspects of membership, the role of internal heterogeneity and inequality is a highly debated issue in collective action theory. Baland and Platteau (1999) claim that with respect to inequality one must differentiate between the heterogeneity of social background and objectives and the heterogeneity of assets. Habyarimana et al. (2009) outline the main mechanisms that link the homogeneity of social background and objectives to successful collective action. Firstly, through strong social cohesion individuals of the same ethnicity, caste, etc. are more likely to take each other's welfare into account. Secondly, the probability of repeated interactions and therefore reciprocity is higher among members of the same ethnicity, and thirdly, it can be observed that monitoring and enforcement of rules is more efficient within homogenous groups. There is less agreement on the impact of economic heterogeneity on collective action. Baland and Platteau (1996) conclude that heterogeneity of assets is less likely to constitute a barrier to collective action than heterogeneity of social background.

Institutional arrangements

Ostrom's empirical work (1990) highlights the importance of institutional arrangements in the context of collective action. She identifies a number of 'design principles' which characterize successful collective management of common pool resources. According to the Tit-for-Tat strategy in a repeated prisoner´s dilemma, the participants need the assurance that each party meets its side of the bargain to avoid opportunistic behavior and to ensure continuing cooperation. Since the expected pay-off and thus the behavior of one party depends on the decisions of the others, monitoring the others' behavior is crucial. After a certain level of cooperation has been reached, the optimal strategy for each individual is to cooperate as long as behavior is reciprocated. Given that their own contribution depends on the behavior of others, participants have an incentive to incur the costs of monitoring to ensure that the strategy to cooperate remains optimal. Hence, monitoring of rules is a critical aspect that contributes to the success of collective action. In this context, it is important that fines are specified and implemented if stated rules are breached by a member (Stockbridge et al., 2003).

External environment

Regarding the external environment, the distance to markets is of particular interest in the context of collective action. With respect to the collective management of CPR, previous research has found that increasing integration into markets has a negative impact on collective action (Araral, 2009). Increasing proximity to markets may lead to relaxed social ties and increased anonymity within the group resulting in less mutual dependencies and thus in reduced incentives to cooperate (Araral, 2009; Ostrom and Gardener, 1993). However, Meinzen-Dick et al. (1997) argue that the impact is not determined by reduced mutual ties, but rather by the improved access to labor markets. Hence, larger distance to markets might be associated with fewer opportunities for off-farm employment, higher search costs and more effort required to obtain market information. This may result in a higher dependency of isolated farmers on collective action to overcome pervasive market imperfections.

Figure 1 summarizes the conceptual framework which guides our study and is derived from the literature review presented above. It conceptualizes collective action based on the structure-conduct-performance approach. Structure-related variables include group characteristics, institutional arrangements and the external environment as outlined above. These variables are hypothesized to influence conduct, that is, the extent of free-riding observed in the group. Finally, we expect that higher levels of free-riding have a negative impact on the performance of the group. In the context of smallholder market access, the most important performance measures relate to the collective marketing performance of the group. Besides the degree of free-riding, other variables are likely to influence marketing performance including the group's marketing strategy, market access, management skills and input and service provision to group members.

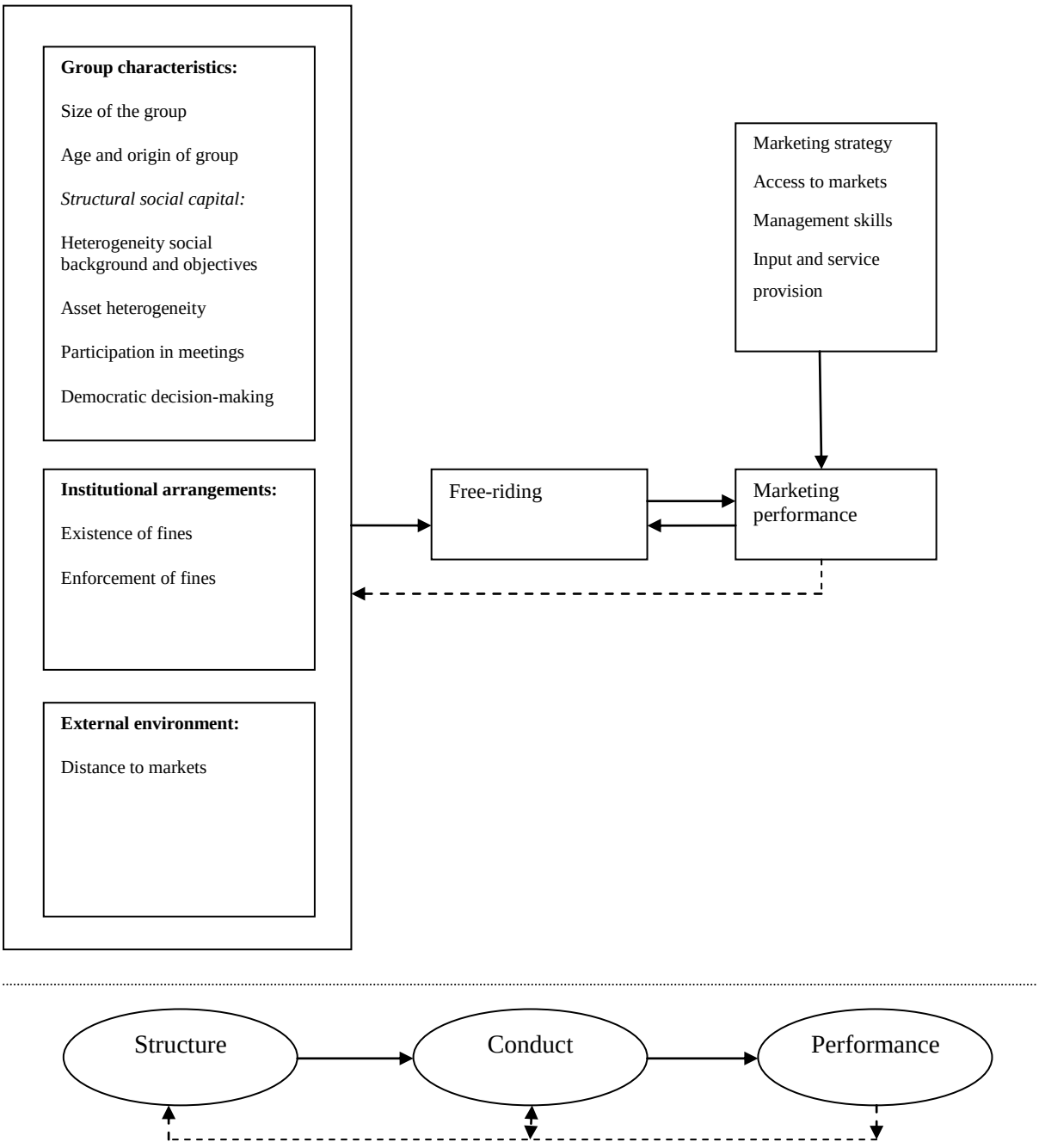

Figure 1: Conceptual framework

Source: Adapted from Meinzen-Dick et al. (2004) and Araral (2009)

4 Study design and descriptive results

The paper uses data from a representative survey of coffee cooperatives in Central and Eastern Province of Kenya. Around 50% of all Kenyan coffee cooperatives are located in these two provinces, which account for approximately 50% of the national coffee production (Ministry of Agriculture,

2010). In preparation for the survey, a list of all cooperatives in this region was compiled in collaboration with the Ministry of Agriculture and with coffee cooperative unions at district level. Out of a total population of 180 coffee cooperatives, 120 cooperatives were randomly selected, ensuring an equal ratio of around 70% of the total population selected in each district. The survey was conducted between January and March 2011.

The target person for the interview was the secretary manager of the cooperative. The secretary manager is employed by the cooperative and was chosen because of two main reasons: (1) The secretary manager is responsible for the accounting and book keeping and thus knows best any data and figures associated with the cooperative. (2) Since the secretary manager is employed by the cooperative and not elected, he seemed to be the most objective person among possible interviewees. The interviews were conducted with a standardized questionnaire that included sections on the following aspects*: (1) General information, (2) Certification, (3) Input provision, (4) Education provision, (5) Processing, (6) Milling/Marketing, (7) Payment to farmers, (8) Organizational structure, (9) Institutional arrangements, (10) Financial status, and (11) social capital among members and between members and millers/marketers.* In general, the data collected refers to the coffee year 2009/10[ii]. Key data, such as the final payment to members, delivered quantity, and marketing strategy, were also recorded for a recall period of five years (2005/06 - 2009/10). These years represent a period of relatively steadily increasing prices for Kenyan coffee on the world market.

In addition to the cooperative survey, four expert interviews were carried out to make tacit knowledge more explicit. These included interviews with representatives of two public institutions, the Ministry of Cooperative Development and Marketing in Nairobi and the Kenyan Coffee Board in Thika. Furthermore, to cover a traditional intermediary between the private and the public sector managers of Mugama Farmers Cooperative Union in Muranga were visited. Finally, we interviewed a more recently emerged stakeholder of the coffee sector, Sustainable Management Services in Nyeri , which is a service provider in the coffee sector and belongs to the international coffee trader ECOM. They provide training and extension services to seven coffee cooperatives in collaboration with the Dutch development organization HIVOS (Humanist Institute for Development Cooperation).

Based on the qualitative expert interviews we identified three practices that are perceived as free-riding behavior: (1) selling coffee cherries at the farm gate to itinerant traders, (2) delivering to neighboring cooperatives without membership, and (3) transferring inputs received from the cooperative to other crops or reselling them to other farmers. Direct observation and measurement of all three indicators is very sensitive since all of these constitute a violation of the core rules of each cooperative. Alternatively, in our survey we asked the secretary manger to rate whether members of the cooperative contribute time and money towards common development goals. This was measured on a five point Likert scale, with 1 indicating a low and 5 indicating a high level of free-riding. The following figure shows the distribution of free-riding among the coffee cooperatives in our sample.

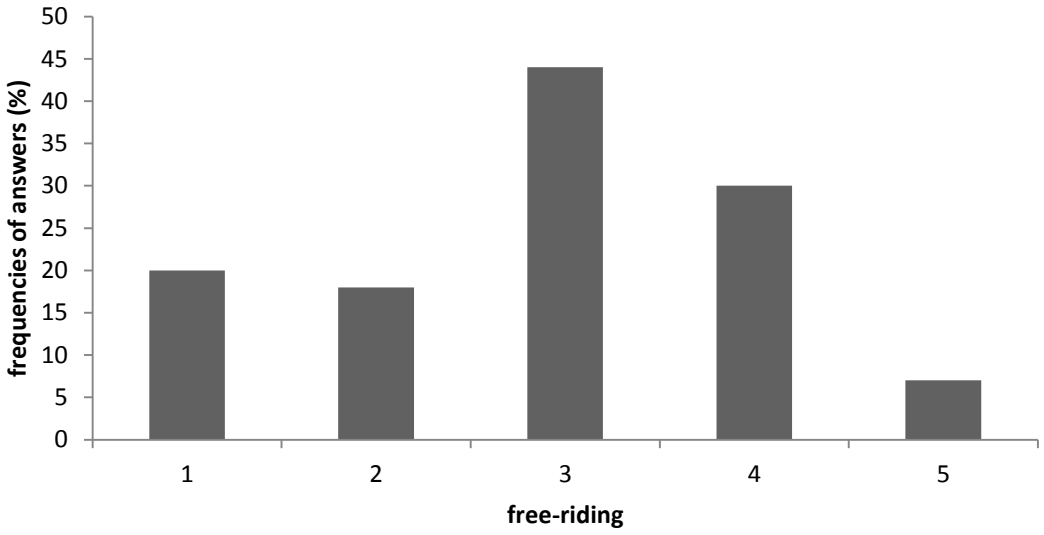

Figure 2: Prevalence of free-riding (frequencies of answers)

As shown in figure 2 free-riding is a relatively common problem among Kenyan coffee cooperatives. While 38% of the cooperatives in our sample indicated low or very low levels of free-riding, 37 reported high or very high levels of free-riding. In table 1, we compare the means values of the marketing performance indicators used in the 2SLS to investigate the impact of free-riding on the performance of the cooperative, per category of free-riding. We apply bonferroni and chi square tests.

Table 1: Descriptive statistics

Free-riding	Final payment to members (ksh)		Average delivered quantity per active member (kg coffee cherries)	
	Mean	**SD**	**Mean**	**SD**
1 (very low)	50.06 (N=15)	3.05	428.11 (N=15) [a] ** [b]*** [c]**	44.99
2 (low)	47.37 (N=17)	3.20	313.57 (N=17)	30.37
3 (average)	49.11 (N=31)	2.54	300.88 (N=26)	25.14
4 (high)	46.64 (N=22)	3.57	259.88 (N=21)	23.98
5 (very high)	50 (N=2)	9	228.81 (N=5)	27.72
Full sample	48.33 (N=87)	1.50	311.63 (N=84) ***	15.34

Statistical significance at the 1% (***), 5% (**) and 10% (*) level.

[a] Difference statistically significant between cooperatives that face very low level of free-riding and cooperatives that face average level of free-riding.

[b] Difference statistically significant between cooperatives that face very low level of free-riding and cooperatives that face high level of free-riding.

[c] Difference statistically significant between cooperatives that face very low level of free-riding and cooperatives that face very high level of free-riding.

Comparing the mean values of final payments to members, we observe no statistically significant differences between the categories of free-riding. With respect to the delivered quantity per active member, the mean is significantly lower in cooperatives that face average, high or very high level of free-riding compared to those with very low level of free-riding.

5 Determinants of free-riding in Kenyan coffee cooperatives

Methodology

We estimate the effect of various potential explanatory variables on the extent of free-riding observed in Kenyan coffee cooperatives using a series of ordered logit estimations. As explained in the previous section, free-riding is measured as a categorical variable ranging from 1 (low levels of perceived free-riding) to 5 (high levels of perceived free-riding). We assume that there is a continuous level of free-riding underlying this perception, which is, however, difficult to quantify and therefore unobserved. The underlying level of free-riding is modeled as

$$Y^{*}=X_1\beta_1 + X_2\beta_2 + X_3\beta_3 + \varepsilon$$

where y* is the latent outcome variable; X_1, X_2 and X_3 are vectors of independent variables related to group characteristics, institutional arrangements, and the external environment, respectively; β is a parameter vector to be estimated; and ε is a random error term. While we do not observe the underlying level of free-riding, we observe that

$$y = \begin{cases} y = 0 \; if \; y^{*} \leq \; \alpha_1 \\ y = 1 \; if \; \alpha_1 < y^{*} \leq \alpha_2 \\ y = j \; if \; y^{*} > \alpha_j \end{cases}$$

$$with \; j = \; 5$$

where α_j are unknown threshold parameters to be estimated.

The independent variables included in the model are derived from the conceptual framework presented in figure 1. The first set of variables included in X_1 relates to the characteristics of the group. We consider three main aspects, namely the size of the group, the age of the group, the origin of the group and structural social capital. With respect to the origin of the group, it is important to note that all Kenyan coffee cooperatives were founded by the government, and therefore, it is of little relevance to make a distinction between state-founded and e.g. farmer-founded groups in this context. However, in the last two decades, many cooperatives have split from their mother cooperatives, mostly due to internal disputes amongst members of the original cooperative. Similar to the member-based foundation of a group, the split-off of a cooperative can be associated with a strengthening of shared norms and trust among members through a process of self-selection. In our model we include a

dummy variable that equals one if the cooperative is a split-off expecting that this will have a negative effect on the extent of free-riding.

Regarding structural social capital, we follow the recommendations of the Social Capital Initiative of the World Bank taking into account three different dimensions, namely the heterogeneity of members, the level of participation in meetings, and the extent of democratic decision-making (Grotaert and van Bastelaer, 2001). With respect to member heterogeneity we distinguish between the heterogeneity in social backgrounds and objectives and asset heterogeneity. The heterogeneity in social background and objectives is measured as the number of factories belonging to the cooperative. Differing numbers in factories per cooperative are due to the fact that factories do not close down with splits of the cooperatives and are not due to needs for higher processing capacities[iii]. Thus, a larger number of factories can be associated with higher variability of social background and objectives among members and is thus likely to result in higher levels of free-riding.

Poteete and Ostrom (2004) state that mechanisms implemented by the institution mediate the sign and size of the effect of heterogeneity on free-riding. In the case of Kenyan coffee cooperatives, the final payment to farmers occurs either at the cooperative level or at the factory level. Hence, the payment at factory level allows for inter-factory, intra-cooperative price variation. The coffee price takes into account the coffee quality produced by the cooperative or factory, each farmer´s contribution is not discernible. Individual farmers have the incentive to free-ride on the efforts of the others to produce high quality coffee within the factory group or cooperative. Therefore, a payment system at the factory level transfers free-riding from the cooperative level to the factory level. We measure the relative distribution of the final payment across the factories belonging to the cooperative over the last five years. A high value indicates that in contrast to the pooling of coffee qualities that takes place at the cooperative level, a differentiation of coffee qualities exists among the factories. According to Baland and Platteau (1999) wealthier users tend to contribute more to collective action than small users. If the coffee quality within one payment system varies greatly, small users tend to free-ride on the efforts of the wealthier farmers because they internalize such a tiny share. It results in an increased likelihood of free-riding by wealthier farmers. This could indicate that wealthier farmers, who produce higher quality coffee, pool their coffee in one factory, separated from poorer farmers. We expect that the resulting differentiation in prices received by farmers delivering to different factories is expected to lead to a decreased likelihood of free-riding of both wealthier and poorer farmers. The variable use as an indicator of this relationship is asset heterogeneity.

To measure the second dimension of structural social capital, i.e. the level of participation in meetings and elections, we include a dummy to control for a low versus high level of participation, whereby one indicates an above average rate of participation. Furthermore, we include two variables to reflect the third dimension of structural social capital, i.e. the extent of democratic decision-making. The first variable measures the number of special general meetings that were held in the last five years. Special

general meetings can be convened by the committee for the purpose of approving annual budget estimates or discussing any urgent matter or by the members of the cooperative for the approval of a special resolution. Special resolutions can be contributed by any member of the cooperative and need to be passed by two thirds of the attending members in a special general meeting. Our second variable takes up this aspect by measuring the number of special resolutions contributed by members in the last five years. We expect that higher levels of democratic decision making within a cooperative have a positive effect on members' identification with the decisions taken by the group and thus a negative effect on free-riding.

Inequality and its linkage to collective action theory is complex and seems an empirical matter through multiple interactions (Bernard and Spielman, 2009). Further, according to Poteete and Ostrom (2004), empirical finding show that heterogeneity also affects collective action through prospects of trust. Therefore, in addition to the variables reflecting structural social capital, we include an interaction term between the heterogeneity in social background and objectives and the level of participation in meetings.

The second set of variables included in X_2 relates to the institutional arrangements governing the relationships within the cooperative. We add a dummy variable that equals one if fines for breaching the by-laws exist and a variable on the number of fines that were enforced in the last five years. We expect that both the existence of fines and the enforcement of these rules have a negative effect on the extent of free-riding.

Finally, the variables included in X_3 refer to the external environment in which the cooperative operates. Three variables are included to reflect the distance to markets. Firstly, we measure the average distance in km from members' farms to an agro-vet shop reflecting farmers' access to input markets. Secondly, we include two variables on the travel time from the cooperative headquarter to the district headquarter and to Nairobi, respectively. Table 1 provides descriptions and summary statistics for the variables included in the econometric model on the extent of free-riding.

Table 2: Description and summary statistics for the variables included in the model on the extent of free-riding

Variable	Measurement	Number of observations	Mean	Standard Deviation	Measurement scale
Free-riding	Do members of the coop. contribute time and money toward common development goals? (1= very low level of free-riding; 2= low level of free-riding; 3= average level of free-riding; 4= high level of free-riding; 5= very high level of free-riding)	119	2.88	1.14	Categorical
Group characteristics					
Size	Number of active members[iv]	119	2071	1905.02	Continuous
Age	Years since cooperative has been founded	119	20	16.93	Continuous
Origin	Cooperative is a split from a mother cooperative	119	.76	.43	Dummy
Heterogeneity in social background and objectives	Number of factories belonging to cooperative	119	3.24	2.56	Continuous
Asset heterogeneity	Relative distribution of the final payment across factories over last five years[v]	120	.90	1.09	Continuous
High participation in meeting	Participation rate in meeting is above average[vi]	120	.44	.50	Dummy
Democratic decision-making	Number of special general meetings in the last five years	116	10.30	6.79	Continuous
	Number of special resolutions contributed by members in the last five years	114	7.97	3.58	Continuous
Institutional arrangements					
Fixation of fine	Fixation of fines in by-laws	117	.78	.42	Dummy
Enforcement of fines	Number of fines enforced in the last five years	117	.25	.96	Continuous
External environment					
Distance to markets	Average distance (km) from members' farms to an agrovet (sells agricultural inputs) shop[vii]	119	3.5	3.19	Continuous
	Travel time (in minutes) from the cooperative headquarter to district headquarter [viii]	119	66	39.56	Continuous
	Travel time (in minutes) from the cooperative headquarter to Nairobi[Viii]	119	264	88.99	Continuous

Econometric results and discussion

This section presents the results of the econometric analysis on the determinants of free-riding. Table 2 depicts the results of the stepwise inclusion of the independent variables - per category (i.e. group characteristics, external environment, institutional arrangements) - into the ordered logit model.

Table 3: Results of the ordered logit models on the extent of free-riding

Dependent variable: free-riding (categorical)	(1) Odds ratio (std. err.)	(2) Odds ratio (std. err.)	(3) Odds ratio (std. err.)
Size (no.)	.9992074***	.9993246**	.9992693***
	(.0002701)	(.000264)	(.0002582)
Age (years)	.9996741	1.001376	1.003706
	(.0164754)	(.0166847)	(.0172244)
Origin (0/1)	2.056956	2.297924	1.884561
	(1.407278)	(1.597433)	(1.319709)
Heterogeneity in social background and objectives (no.)	2.039707***	1.942629***	2.099722***
	(.42305)	(.3996246)	(.4384977)
Heterogeneity in social background and objectives* high participation in meetings	.4889576***	.5177369***	.5082479***
	(.1214104)	(.1297831)	(.1241538)
Asset heterogeneity	.6451663*	.6563974*	.653707*
	(.1556134)	(.1625918)	(.1640211)
High participation in meeting (0/1)	2.900023	2.823965	2.91808
	(2.040653)	(2.0308243)	(2.137151)
Special general meetings in last five years (no.)	.9399306	.9588047	.9268203
	(.0615158)	(.0704831)	(.0361943)
Special resolutions contributed by members in last five years (no.)	.9253191**	.9106262**	.9268203*
	(.0304273)	(.0332072)	(.0361943)
Experience of secretary manager (years)	.9501449	.95094	.9731259
	(.0479177)	(.0484407)	(.0496087)
Experience of chairman (years)	.9357644	.9294823	.9355856
	(.05186)	(.0522503)	(.0533246)
Education of leadership (0/1)	1.396355	1.259313	1.375637
	(.6709348)	(.6219238)	(.709113)
Fixation of fines in by-laws (0/1)		.3263577**	.2865778**
		(.1895262)	(.1710546)
Fines enforced in the last five years (no.)		.9982062	1.126605
		(.183161)	(.2149425)
Distance from members´ farm to agrovet shop (km)			1.119621
			(.0829681)
Travel distance from coop. headquarter to district headquarter (min.)			1.004519
			(.0057194)
Travel distance from coop. headquarter to Nairobi (min.)			1.005505**
			(.0026997)
Number of observations	97	95	95
LRchi2 ( )	(12) 38.72	(14) 41.93	(17) 50.01
Prob>chi2	.0001	.0001	.0000
Likelihood-ratio test of proportionality of odds LRchi2 ( )	(36) 29.32	(41) 38.17	(50) 54.26
Prob>chi2	.7768	.5969	.3154

***p<0.01 **p<0.05 *p<0.1

The ordered logit model relies on the underlying assumption of proportional odds across response categories. We use an approximate likelihood ratio test to test the null hypothesis that there is no difference between the coefficients across categories. In all three models, the null hypothesis of proportional odds cannot be rejected indicating that the ordered logit model is an appropriate specification. An odds ratio greater than 1 indicates a positive association between the respective independent variable and the outcome variable; with an increasing value of the respective independent variable, the likelihood of being in a higher versus the combined middle and lower categories increase, c.p.. Likewise, for one unit increase in the value of the independent variable, the odds of the combined high and middle categories versus low categories increase. An odds ratio smaller than 1 implies that the increase in the value of an independent variable is associated with a decreased likelihood of being in a higher category, c.p..

In addition, we apply the Likelihood Ratio (LR) Chi-Square test that at least one of the predictors' regression coefficients is not equal to zero in the model, which shows that all models have explanatory power at 1% significance level. The test for multicollinearity shows Variance Inflation Factors (VIFs) smaller than 10. Furthermore, the parameter estimates for all explanatory variables remain robust across the different model specifications.

Column (1) depicts the results of the ordered logit model on the extent of free-riding considering aspects of group characteristics as potential explanatory variables. Findings show, that with increasing group size, the probably of low levels of free-riding increases. Empirical analyses outline the controversial debate about the effect of group size on collective action. As expected, the results indicate that with increasing heterogeneity in social background and objectives as indicated by the number of factories per cooperative the likelihood of higher levels of free-riding increases. In contrast, a negative relation between the interaction term and the level of free-riding can be observed. It shows that heterogeneity in social background and objectives can even foster collective action if the cooperative is host to a high participation rate in elections and meetings, which confirms similar findings of Bernard and Spielman (2009). This also confirms the conclusions of Poteete and Ostrom (2004) that mechanisms implemented by the institution can mediate the effect of heterogeneity on free-riding. With increasing asset heterogeneity as shown by high variance in the final payment across factories over last five years the likelihood of free riding decreases. Following the arguments of Baland and Platteau (1999) this could signify differentiation of the coffee quality among the factories, indicating that wealthier separate their coffee from those of poorer farmers, which decreases the incentive to free-ride. The number of special resolutions contributed by members in the last five years has a significantly negative effect on free-riding. This is consistent with the idea that democratic decision-making can lead to a shift from ‘multiple cognition’ to ‘collective cognition’. Through the process of democratic decision-making individuals with quite different perceptions can develop shared

values, resulting in increased collective cognition and thus a reduced probability of free-riding (see, Kruijssen et al., 2009; Stockbridge et al., 2003).

In column (2) we account for the dimension of institutional arrangements. The existence of fines has a negative and significant effect on free-riding. This is consistent with previous research that has shown that the participants of the game need the assurance that each party meets its side of the bargain to avoid opportunistic behavior and ensure continued cooperation (see, Ostrom, 1990). Our results thus show that the definition of clear rules and penalties for non-compliance with these rules can be an important factor contributing to the success of collective action.

In column (3) we additionally consider aspects of the external environment, more specifically, we focus on the distance to input and output markets. Unlike expected, we find that with increasing distance to Nairobi the extent of free-riding experienced by the cooperative increases. This is contrary to previous studies that have argued that due to relaxed social ties and high opportunities for off-farm employment, free-riding is likely to be more prevalent in areas located in close proximity to markets (Ostrom and Gardener, 1993; Meinzen-Dick et al., 1997). In our study, the positive effect of distance on free-riding might be explained by the fact that in those districts located further away from Nairobi coffee has successively lost importance during recent years and farmers have replaced their coffee trees with Miraa[ix] cultivation, which has the advantage of comparably low input costs and of providing a daily income source.

6 Determinants of the marketing performance of Kenyan coffee cooperatives

Methodology

In a second step, we analyze the effect of free-riding on the performance of Kenyan coffee cooperatives. Besides primary processing and the supply of inputs and extension services, coffee cooperatives in Kenya are responsible for the marketing of the members' products. In this study, performance is measured by two indicators, namely the delivered quantity of coffee cherries per active member and the final payment to members.

The direction of causation with respect to the relation between free-riding and performance is not straight forward. Reverse causality may lead to biased ordinary least squares estimates (OLS). The direction of bias in the parameter estimates depends on the sign of the reverse effect of collective marketing performance on the occurrence of free-riding. It can be expected that poor performance increases the probability of occurrence of free-riding. This entails that a negative reverse causality between marketing performance and free-riding, leading to an underestimation of the coefficient of free-riding.

$$y_{1i} = y'_{2i}\,\beta_1 + x'_{1i}\,\beta_2 + \varepsilon_i \;, i = 1, \ldots,$$

With the scalar dependent performance variable y_1, depending on endogenous regressor free-riding, indicated by y_2; and K_1 exogenous regressors, denoted by x_1. The regression errors ε_i expect to be uncorrelated with x_1, but are correlated with y_2 . In this case, β_1 cannot be treated as the true level effect of the occurrence of free-riding on collective marketing performance. In order to correct for the reverse causality, we apply a standard instrumental variable technique. The instrument x_2 for the endogenous free-riding variable y_2 has to satisfy the assumption that $E(\varepsilon_i I\, x_{2i})=0$, but correlated with the free-riding variable y_2. Following Cameron and Trivedi (2010) the first stage equation is applied.

$$y_{2ji} = x'_{1i}\pi_{1j} + x'_{2i}\,\pi_{2j} + \nu_{ji} \;,\; j = 1$$

According to Angrist and Krueger (1991) the application of a probit or logit in the first stage is not necessary or even self-defeating due to two aspects: (1) In a two-stage least square, the consistency of the parameter estimates in the second stage does not depend on the suitable functional form of the first stage (Roy and Thorat, 2008) and (2) Plugging directly the fitted values of a non-linear estimation in the first stage into a linear regression in the second stage - with the exception that the assumption of linearity is exactly right - can cause inconsistent estimates (Roy and Thorat, 2008). Therefore, we use a linear model in the first stage to receive predicted values for free-riding[x]. In order to satisfy the exclusion criterion of an instrument, we estimate a two-stage least square model with the number of special resolutions contributed by members and the existence of fines (0/1) as instruments.

In order to identify determinants of collective marketing performance, we apply an OLS as well as 2SLS with final payment to members as the dependent variable. Farmers are paid at least twice annually. The first payment is paid at the beginning of the season (January-March), as a so-called coffee advance payment. Advance payments are calculated as the lowest expected payment per kg for the coming season. Hence, at the end of the season after coffee sales have been realized, the remaining amount is distributed to farmers as the second or third payment. The variable final payment is equal to the overall payment per kg coffee cherries delivered (incl. advance payment) in the respective crop year. The calculation of the final payment by the cooperative committee members is based on the revenue received from coffee sales. The cooperative management deducts then all of its operating costs, including maintenance and service expenses, loan repayments and salaries. The final payment can either be done at cooperative level or factory level. If the final payment is done at factory level, the non-weighted average final payment across all factories was included in the regression.

We model the final payment to members as a function of the level of payment, the revenue share paid to members, the share of coffee graded as AA/AB, the marketing strategy, management skills, market access and free-riding. The summary statistics of the variables in the model are depicted in table 3.

As mentioned above, the final payment to members is derived from the revenue. In order to estimate the marketing performance of Kenyan coffee cooperatives we expose the cost effect included in the final payment. The coffee prices received at the auction heavily depend on the quality of coffee produced by the cooperative. The green coffee in Kenya is sold in grades[xi]. Due to the deterioration of the auction prices between the grades AA /AB and C, the share of green coffee graded as AA/AB is included in the regression [xii]. In the last five years, two new market opportunities emerged: (1) certification and (2) direct marketing. The option for direct marketing was introduced in 2005/06.The policy change aimed to empower the cooperatives to participate directly in the marketing process and hence generate higher revenues from coffee sales. In order to make use of this opportunity coffee cooperatives have to obtain a marketing license which authorizes them to bargain directly with coffee exporters or external marketing agents by passing the coffee auction.

Around 83% of the cooperatives state that at least one marketer was a sub company of the miller the cooperative delivered to in 2009/10. Hence, the choice of the miller determines the marketer choice and thereby the marketing strategy of the cooperative. Consequently, the following analysis comprises variables referring to the miller. The interviewed experts highlighted the impact of the liberalization on the milling sector. The monopoly in the milling sector held by Kenya Planters Cooperative Union (KPCU) was abolished. Recently, Kenya's milling sector has been dominated by six companies. A lack of transparency (e.g., the exchange rate from US dollars to Kenyan Shilling or milling losses) and poor services result in a low degree of trust between cooperative and miller and relatively short-term supply relationships. The choice of the miller within the cooperative is often subject to internal conflicts among members. Pressure among members concerning the election is driven by the manipulation of farmers by millers at the farm level. Many farmers admitted to the experts that they have accepted bribes to vote for a specific miller. Hence, the degree of instability of the marketing strategy and the aspect of election capture are incorporated in the model. Furthermore, district dummies are considered with Meru North, as the base case.

The second performance criteria captures production performance via the indicator average delivered quantity of coffee cherries per active member. It is estimated as a function of the agroclimatic suitability for coffee production of the cooperative's location, the marketing strategy, management skills, market access and free-riding. Again, we incorporate district-level dummies. Table 4 shows the summary statistics of the variables of the model.

To account for marginal coffee zones in the estimation, the suitability for coffee husbandry, as a dummy variable was included in the regression. Farm inputs incorporated in the questionnaire are inorganic fertilizer, pesticides, herbicides, machines for pruning and application of chemicals, and plant material, as coffee seedlings and shade tree seedlings. Chemicals and plant seedlings are mainly provided on credit to members. Hence, the average deduction per active member for inputs on credit is

taken. Further variables taking into account in this model are akin to those incorporated in the model of first marketing performance criteria.

Table 4: Summary statistics of outcome and predictor variable incorporated in the 2SLS and OLS model with final payment to members as the dependent variable and delivered quantity of coffee cherries per active member (kg) respectively.

Variable	Measurement	Number of observations	Mean	Standard Deviation	Measurement scale
log payment	Final payment paid to members (ksh/delivered kg of coffee cherries)	117	3.83	.33	Continuous
Production	Average delivered quanity of coffee cherries per active member (kg)	116	309.44	140.05	Continuous
Free-riding	Do members of the coop. contribute time and money toward common development goals? (1= very low level of free-riding; 2= low level of free-riding; 3= average level of free-riding; 4= high level of free-riding; 5= very high level of free-riding)	119	2.88	1.14	Categorical
Payment level	Payment occurs at the cooperative level	119	.37	.48	Dummy
Revenue share	Revenue share paid to members	118	80.74	5.69	Continuous
Quality share	Share of green coffee graded as AA/AB	102	53.85	16.40	Continuous
Suitability coffee	Land suitable for coffee husbandry [xiii]	110	.83	.38	Dummy
Input/service provision					
Input provision	Input provision through cooperative	119	.90	.30	Dummy
Input quantity	Average deduction (Ksh) per active member for inputs on credit	112	825.15	1054.95	Continuous
Advance payment	Provision of advance payments	119	.78	.41	Dummy
Transport services	Provision of transport facilities of coffee cherries from members´ farm to factories	119	.14	.35	Dummy
Trainingsindex (member)	Number of training days received by the members/(number of active members/average number of participants per training day)	113	.03	.08	Continuous
Marketing strategy					
Certification	Cooperative is certified	119	.05	.22	Dummy
Direct marketing	Cooperative used direct marketing channel	112	.35	.48	Dummy
Instability of marketing strategy	Share of seasonally changing millers over last five years	116	1.11	.78	Continuous
Election capture	Pressure among members concerning the vote of the miller exists	115	.54	.50	Dummy
Management skills					
Rotation factory manager	Factory managers rotate among the cooperative´s factories	119	.40	.49	Dummy
Trainings index committee members	Number of training days received by the management/(number of committee members/average number of participants per training day)	119	.19	.24	Continuous
Education cooperative´s leader	Highest educational level of secretary manager or chairman, college or university	115	.76	.43	Dummy
Market Access					
Village distance	Average distance (km) from members' farms to an agrovet shop	119	3.5	3.19	Continuous
District headquarter	Travel hours (minutes) from the cooperative`s	119	66	39.56	Continuous

distance	headquarter to district headquarter				
Instrumental Variables					
Special resolutions	Special resolutions contributed by members in the last five years	114	10.30	6.79	Continuous
Fixation of fines	Fixation of fines in by-laws	117	.78	.42	Dummy

Econometric results and discussion

Table 5 outlines the results of the OLS and two-stage least square estimations with the log of the final payment to members and average delivered quantity of coffee cherries per active member as the dependent variables.

Table 5: Coefficients (standard errors in parentheses) of the 2SLSs and OLSs with final payment and average delivered quantity per active member as the dependent variables, respectively.

	log_final payment to members (ksh/delivered kg coffee cherries)		Average delivered quantity of coffee cherries per active member (kg)	
	OLS	2SLS	OLS	2SLS
Free-riding	-.0474081*	-.088342*	-16.54384	-37.30742**
	(.0246304)	(.0417155)	(10.99641)	(17.84065)
Payment level (0/1)	.0476305	.0399146		
	(.0590683)	(.0520599)		
Revenue share	.0186997**	.0174597**		
	(.0038805)	(.0035249)		
Quality share	-.0007158	-.0012617		
	(.0015046)	(.001343)		
Suitability coffee production (0/1)			31.64774	47.69728
			(36.4621)	(32.54415)
Input/service provision				
Provision farm inputs (0/1)			94.392**	80.54934**
			(45.80354)	(40.02479
Extent of farm input provision (ksh/active member)			.0361061**	.0312752***
			(.0123779)	(.0112416)
Provision advance payment (0/1)			39.15486	54.35803*
			(29.48792)	(27.89955)
Provision transport services (0/1)			-35.50056	-32.25985
			(36.19449)	(31.30354)
Trainings index committee member			205.6086*	211.1429**
			(118.7366)	(102.4802)
Marketing strategy				
Certification (0/1)	.1147741	.1114904	115.1291	106.0629*
	(.138799)	(.1201988)	(71.9123)	(61.99627)
Direct marketing (0/1)	.0120405	.0001408	14.87588	9.954216
	(.0493739)	(.0445061)	(23.82516)	(21.26491)
Instability of marketing strategy	-.0603472**	-.0557574**	-40.02473***	-40.90173***
	(.0300941)	(.026353)	(14.7849)	812.98224)
Election capture (0/1)	-.0975037*	-.08571*	-17.80116	-9.945263
	(.0506128)	(.0449226)	(23.82516)	(20.64066)
Management skills				
Rotation factory manager (0/1)	.0618939	.0484522	-19.95554	-21.81593

	(.0557006)	(.0499248)	(24.08923)	(21.13078)
Trainings index committee members	.1430576	.1617814*	37.61897	36.3964
	(.09281)	(.0808292)	(41.77854)	(35.91172)
Education cooperative´s leader (0/1)	-.0362668	-.0260307	20.99707	23.4796
	(.0541274)	(.0479711)	(26.9356)	(24.21027)
Market Access				
Distance from members´ farm to agrovet	-.0168086**	-.0137568*	-2.466958	-2.149626
shop (km)	(.0082788)	(.0076688)	(3.879857)	(3.341769)
Travel distance from coop. headquarter to	-.0003045	-.0001028	.6541165*	.7603875**
district headquarter (min.)	(.007436)	(.0006629)	(.3751073)	(.3280533)
Number of observation	89	87	86	84
F	(22,66) 7.95	(22,64) 7.80	(25,60) 6.23	(25, 58) 5.92
Prob>F	0.0000	0.0000	0.0000	0.0000
Adj R2/ Centered R2	0.6348	0.7261	0.6059	0.9518
Wu-Hausman F test				
F		(1/63) .94054		(1/57) 1.40966
p-value		.33556		.24004
Underidentification test				
p-value		.0000		.0000
Stock-Yogo weak ID test				
F statistics		11.105		11.122
Sargan statistic				
p-value		.4787		.5388

Depicted are coefficients; Standard errors in parenthesis

***p<0.01 **p<0.05 *p<0.1

District dummies are included. Full model results are available from the authors on request

A Wu-Hausman F test is applied to test whether free-riding is exogenous to the models. The null hypothesis states that an OLS estimator of the same equation would yield consistent estimates. The p-values indicate that endogenous regressors´ effects on the estimates are not meaningful. Hence, in the following we focus on the discussion of the OLS results.

The parameter estimate for free-riding in the OLS regression with log_payment indicates that with increasing levels of free-riding in the cooperative the final payment to members decreases significantly. However, in the second OLS estimation the level of occurrence of free-riding has no statistical significant impact on the average delivered quantity of coffee per active member. Across both models, instability of the marketing strategy is significantly and negatively related with performance. Table 6 presents further descriptive results on the cooperatives´ perceptions with respect to the milling sector. They show that such perceptions are characterized by a low level of trust, resulting in short-term relationships. The establishment of long-term marketing strategies and trust-based chain relationships, resulting in lower monitoring and enforcement costs, is missing. Short-term marketing relations due to price dissatisfaction are likely. In order to consider this problem further the interviewees were asked in an open question to name the main reason for the last change. Besides the aspect of missing service/technology (33.3% of the respondents), lack of transparency (13.3%),

collapse of the miller, referring to the collapse of KPCU in 2008 (6.7%), and others (13.3%), 33.3% of the respective secretary managers mentioned aspects referring to prices or charges. Hence, instability is an indicator capturing a complex relationship of perception, trust and satisfaction between the cooperatives and the milling sector.

Table 6: Cooperative´s perceptions with respect to the milling sector

Indicator	Low level of trust	Average level of trust	High level of trust
Most millers in the coffee sector are basically honest and can be trusted.	35.29	46.22	18.49
In the last five years has the level of trust improved, worsened or stayed the same?	7.83	21.74	70.43
In the milling sector, one has to be alert or someone is likely to take advantage of you.	71.79	21.37	6.84

Depicted are frequencies of answers (%)

Anecdotal evidence has highlighted the problem of election capture, which significantly impacts the final payment to members. Election capture refers to the situation in which millers pay bribes to members of the cooperative in order to get their vote. This form of manipulation often leads to the occurrence of intra-cooperative conflicts, associated with the use of pressure and violence among members of the cooperative or against committee members. Finally, rent-seeking behavior by farmers and committee members occurs, resulting in short term decision making by committee members in choosing the appropriate marketing strategy.

Finally, market access in terms of distance from the cooperative headquarters to the nearest agrovet shop is negatively associated with a decrease in payout to the cooperative's members. With an increase in the distance of the cooperative headquarter to district headquarter the delivered quantity of coffee cherries increases significantly. Considering that we do not account for the number of trees per active member in the marketing performance indicator, the result might be explainable by a higher number of trees due to low perishability of coffee compared with dairy or vegetable, implying a greater attractiveness of coffee production in relatively remote areas.

Indeed, considering the low production level of Kenya´s coffee cooperatives and a lack of input, financial service and education in Kenya´s coffee smallholder production systems, coffee cooperatives can play a major role in providing such services. It is not surprising that both input provision per se and the extent of input provision through the cooperative have a statistically positive impact on the quantity delivered. Similarly, the extent of training provided to members through the cooperative positively affects the delivered production per active member. Training is mainly provided by private service suppliers. The partial collapse of the cooperative unions in the late 90´s led to an increased importance of the private sector or non-governmental extension service suppliers. Currently five major service suppliers, often closely related to the milling sector, can be counted in Kenyan coffee sector.

The provision of training and capacity building through the cooperatives and the promotion of relationships between the cooperatives and the private sector are objectives of their work in order to increase production volume, meet quality and safety standards and foster the certification process. As expected, cooperatives that offer advance payments to their members have on average a higher production per active member.

7 Conclusions

In the last two decades, Kenya's total coffee production and yield per hectare, especially in the smallholder sector, have considerably decreased. This decrease cannot only be attributed to low and volatile coffee world market prices, since Kenyan coffee commands premium prices, which have steadily increased. Political reforms in Kenya's coffee sector, from the early 1990s onward, considerably influenced the structure of the national coffee value chain. On the one hand, through the reduction of government involvement, the reforms encouraged farmer and private sector participation in the coffee sector. Due to enhanced competition in the coffee value chain, processing costs and statutory deductions, especially in the milling and marketing sector, were significantly reduced. On the other hand, problems of corruption, political opportunism and gross mismanagement across all institutions in the coffee sector, especially in coffee cooperatives, were exacerbated (Mude, 2007). Hence, intra-cooperative factors are likely to explain at least partly the decrease in coffee production and yield per ha.

In this study, we use original survey data from 120 coffee cooperatives located in ten provinces of Kenya to investigate the factors influencing free-riding at the cooperative level and the impact of the extent of free-riding on the performance of coffee cooperatives. Performance is measured by two indicators; the final payment to members and the quantity of coffee cherries delivered per active member.

We find that group size, asset heterogeneity, the number of special resolutions contributed by members, and the existence of fines have a negative effect, i.e., they reduce the extent of free-riding in Kenyan coffee cooperatives. Furthermore, heterogeneity in social background and objectives and the distance to the capital city increase the level of free-riding. Our findings emphasize the importance of institutional arrangements that, on the one hand, empower members to govern the cooperatives based on democratic decision-making and, on the other hand, legitimize leadership to take disciplinary action against free-riding behavior. This can be achieved for example through the introduction of sanctions and fines that may effectively reduce members' incentives to free-ride by formulating clearly defined institutional boundaries. In this context, it could be shown that it is essential that the formulation is based on democratic participation in order to secure internal cohesion. Additionally, efforts must be taken to ensure that self-interested individuals in management positions do not behave

as rent-seekers. The implementation of mechanisms that encourage transparent decision-making, such as record keeping and effective internal control mechanisms is important in this regard.

Moreover, our analysis shows that free-riding has a significant and negative effect on the final payment paid to the members of the cooperative. Further factors that have a negative and significant effect on final payment to members include the instability of the marketing strategy, i.e. the share of seasonally changing millers over the last five years, the existence of pressure among members concerning the vote of the miller, as well as the distance to a dealer selling agricultural inputs. Since the liberalization of the coffee sector the organizational structure of the milling and marketing sector has changed dramatically. More recently, the supply relationship between the coffee cooperative and the miller or marketer is increasingly characterized by low levels of trust and lack of transparency, resulting in short-term relationships. Payment of bribes by millers at the farm level results in pressure among the members on committee members trying to influence the choice of the miller and thereby the final payment to members.

The results of this study support the need of facilitating an institutional environment that fosters transparency and boosts cooperative members' bargaining power. Important attempts, such as a required deposit of a coffee sample by the miller at the CBK in order to foster transparency in the grading process, should be further pursued.

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[i] Farmers who have less than 5 acres of coffee are defined as smallholders (Ministry of Agriculture, 2010).

[ii] The coffee years 2009/10 includes the months between 1st October 2009 and 30th September 2010
In the sample the capacity of the factories is only used up to an average of 20%.

[iv] The active membership obliges the delivery of at least one kg of coffee cherries to the cooperative within one year. It authorizes the member to receive inputs and further services from the cooperative.

[v] The relative distribution is calculated as the highest final payment paid by a factory minus the lowest final payment paid by a factory divided by the average payment across all factories belonging to the cooperative

[vi] A term for a member of the committee is fixed at three years. Each year a certain share of members is up for re-election. The election takes place either at the cooperative level or the factory level. Each cooperative has five, seven or nine committee members, depending on the group size. This implies, considering a three year rotation term that one, two or three committee members face the election every year. Across all cooperatives, the average participation rate of cooperative members in the election of the committee members is at 24%, descriptive analysis showed no link between the number of committee members that face the election, the number of factories that vote and the average number of participants. Hence, we use as indicator the dummy variable indicating a cooperative with above election participation rate.

[vii] The data are based on estimations of the secretary manager.

[viii] The calculation of the travel time is based on the market accessibility analysis developed by the International Center for Tropical Agriculture. The accessibility surface is derived by running a cost distance analysis on the friction surface. The friction surface is a grid where each cells value represents the cost of traversing that particular cell. The cost calculation takes into account the road condition, slope of the road, land use class (agriculture/non agriculture), urban areas, rivers and barriers. Further information on this methodology can be found at http://gisweb.ciat.cgiar.org

[ix] Mirraa (also known as *khat)* used as a stimulant is mainly exported to Nairobi or Somalia.

[x] Results of the linear first stage regression are available from the authors on request.

[xi] In the mills, the green coffee is graded. Currently, twelve different coffee grades are traded at the auction (AA/AB/C/E/MH/ML/PB/T/TT/UG/UG1/UG2).

[xii] [xii] Constrained data availability of the grades produced by the cooperative forced us to use the share of green coffee graded as AA/AB estimated by the secretary manager.

[xiii] This dummy variable considers various agro-ecological aspects, as average annual rainfall of 1200-2500ml, mean annual temperature of 15-24 Celsius, altitude 1100-2073m above sea level and loamy soil fertile, well drained clay. The GPS coordinates of the cooperatives' headquarters were used.