Transaction costs and participation in avocado export marketing in Murang'a County, Kenya

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Transaction costs and participation in avocado export marketing in Murang'a County, Kenya

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Abstract

Purpose – The purpose of this paper is to investigate the role of transactional costs on smallholder avocado farmers' participation in the export market and the extent of participation in Murang'a County, Kenya.
Design/methodology/approach – Data was collected from 384 avocado farmers in Murang'a County, following stratified sampling. The Heckman two-stage model was used for analysis.
Findings – Results showed that the cost of information search was an important variable that impedes smallholders' participation in export marketing while harvesting costs inhibits the extent of participation in export marketing.
Research limitations/implications – This study used data at the farm level. Therefore, insights on transaction costs among other marketing agents in the export market value chain would be an issue for future studies.
Originality/value – Following the debate on transaction costs and market participation among farmers in Sub-Sahara Africa, this paper models transactional costs and export market participation among avocado smallholders and measures the extent of participation with the inclusion of harvesting costs, negotiation costs, monitoring costs and information search costs that are not common in previous studies, thus contributing to the development of literature.

Keywords Transaction costs, Export market participation, Heckman two-stage model
Paper type Research paper

1. Introduction

In Sub-Saharan Africa (SSA), the agricultural sector dominates most of the rural economies and contributes more than 17% of Gross Domestic Product (Nnadi *et al.*, 2012; Tura *et al.*, 2016; Reddy *et al.*, 2018). The sector comprises small scale farmers characterized by an average farm size of less than 2 hectares (Mottaleb, 2018; Siddique *et al.*, 2018). These farmers are vulnerable to poverty and have limited access to markets (FAO, 2015). Agricultural market participation thus plays a vital role in the alleviation of poverty and hunger. It unlocks opportunities to rural economies like employment creation, infrastructural development, foreign exchange earnings and income generation, and hence, promoting economic development (World Bank, 2008; Barrett, 2008; Reddy *et al.*, 2018; Yaseen *et al.*, 2018). Therefore, a focus on improved production and market participation is integral in the realization of full agricultural potential among developing countries (Adepoju *et al.*, 2019).

While the export of fresh produce from developing nations to high-income countries has been reported to be on the increase, small scale farmers may not be benefiting much from this

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trend (Annor *et al.*, 2016; Romero Granja and Wollni, 2018). This is because farmers find it difficult to participate in these markets due to constraints like transaction costs (Jagwe, 2011; Sathapatyanon *et al.*, 2018). These costs are classified into proportional transaction costs and fixed transactional costs (Jagwe, 2011; Macharia *et al.*, 2014). Proportional transactional costs include costs that are directly related to the quantity of output marketed (Macharia *et al.*, 2014), while fixed transactional costs are invariant to the proportion of output marketed (Jagwe, 2011). Further, these costs are characterized by the remote location of the farmer, poor roads and limited access to market information (Alene *et al.*, 2008).

Uptake and production of avocado have been on an upward trajectory in Kenya (USAID, 2017). In addition, there is a high potential for growth with the latest opening of the Chinese market and the adoption of high yielding varieties. Small-scale farmers, however, face a bundle of challenges when trading in export markets (OECD, 2018). Notable bottlenecks include unavailability of market information, underdeveloped production systems, delayed payment for fruits delivered and failure to meet qualitative standards of the export markets (Shiferaw, 2018). In effect, these limitations tend to crowd out small smallholder involvement in the export market chain.

The Kenya Vision 2030 economic pillar is geared toward transforming agriculture from subsistence farming to agribusiness; hence, there is a need to understand the factors that promote or prevent farmers from participating in agricultural marketing (Abayneh and Tewodros, 2013; Saenger *et al.*, 2013). It is also evident that various transactional costs are barriers to smallholders' market participation (Macharia *et al.*, 2014; Jagwe, 2011; Makhura *et al.*, 2001). Thus, there is a need for alternative institutions like farmer marketing organizations and policy strategies that overcome these barriers and especially in export marketing. Studies carried out in Murang'a County focused on determinants of export participation (Mwambi *et al.*, 2016; Oduol *et al.*, 2017), but the transaction costs and export marketing has not been documented. Thus, this paper models the role of transactional costs on export market participation and the extent of participation among smallholders in Murang'a County, Kenya.

The rest of the paper is organized in the following order; Section 2 gives the literature on transactional costs and market participation, export value chain governance and the conceptual framework. Section 3; provide methodology applied; Section 4: results and discussion. Section 5 conclusion and recommendation based on key findings.

2. Literature review

2.1 Transactional costs and market participation

A review of the existing literature suggests that there is a relationship between transactional costs and market participation. The works of Alene *et al.* (2008), Jagwe (2011), Bwalya *et al.* (2013), Osebeyo and Aye (2014) and Macharia *et al.* (2014) have introduced that there are various types of transactional costs such as negotiation costs, information search costs and costs of monitoring contracts, and have been found to influence farmers' decisions on market participation. Specifically, information search cost reduces the probability of farmers' participation in agricultural marketing (Alene *et al.*, 2008; Jagwe, 2011; Mabuza *et al.*, 2014; Macharia *et al.*, 2014). Farmers, in most cases, lack the required information on the prevailing price and market demand (Makhura *et al.*, 2001). Thus, giving rise to information search costs while locating trade partners (Mabuza *et al.*, 2014; Macharia *et al.*, 2014). Negotiation cost influences the level of participation in agricultural marketing (Mabuza *et al.*, 2014). Monitoring costs entails the costs of drafting and enforcing contracts (Jagwe, 2011). Asymmetric information and produce uncertainty drives farmers into these contractual arrangements (Vroegindewey *et al.*, 2018; Annor *et al.*, 2016; Pascucci *et al.*, 2015).

On the other hand, proportional transactional costs such as cost of sorting and grading, as well as transport costs, affect the market participation and also the sales (Jagwe, 2011; Macharia *et al.*, 2014). These costs are expected to affect only the proportion of output marketed in a particular market (Bwalya *et al.*, 2013). Costs of sorting and grading were found to reduce the extent of participation in the maize output market (Macharia *et al.*, 2014). Transport cost affects the intensity of market participation, as reported by studies investigating transactional costs and market participation (Alene *et al.*, 2008; Gani and Adeoti, 2011; Macharia *et al.*, 2014; Osebeyo and Aye, 2014; Okoye *et al.*, 2016). This is in that high cost of transport reduces the *ex-ante* decision on market participation and also the proportion of produces to be sold (Buckmaster, 2012).

Transactional cost variables such as distance to market, access to market information and road infrastructure affect market participation (Alene *et al.*, 2008; Osebeyo and Aye, 2014; Okoye *et al.*, 2016). A couple of studies have indicated that distance to market presents a negative influence on farmers' decision to participate in marketing (Cuevas and Claret, 2015; Okoye *et al.*, 2016). Increased distance to market enhances the transport cost, which lowers the effective price that is received by the farmers (Buckmaster, 2012). Access to market information plays minimizes the cost of information search (Alene *et al.*, 2008). As noted by Randela *et al.* (2010), information bottlenecks increase transactional costs by raising information search and negotiation costs (Randela *et al.*, 2010). Remote location with poor road infrastructure leads to high transport costs, and in instances where the buyers bear the transport cost, buyers reduce the prices to be paid to farmers (Makhura *et al.*, 2001). This results in higher search and monitoring costs, which, in turn, impedes farmers' participation in markets, consecutively reducing sales (Randela *et al.*, 2010).

This study contributes to the existing literature by modeling transactional cost and participation in export market among avocado smallholders that is thin in literature. Previous studies focused on transaction costs in cereals (Alene *et al.*, 2008; Bwalya *et al.*, 2013; Macharia *et al.*, 2014), in tubers such as cassava (Okoye *et al.*, 2016), and to the best of our knowledge, nothing has been done on avocado smallholders participation in the export marketing context.

2.2 Export market value chain governance

The export value chain in Murang'a County entails actors such as avocado nursery operators, producers (farmers), traders, brokers, processors and exporters (Oduol *et al.*, 2017). Nursery operators are few and consist of government institutions such as Kenya Agricultural and Livestock Research Organization (KALRO) and individual farmers. These nurseries supply farmers with improved avocado seedlings such as Hass and Fuerte varieties (Oduol *et al.*, 2017). Local traders and brokers buy the avocado that does not meet export standards (Amare *et al.*, 2019). These middlemen sell the produce to processors in the local and regional towns like Thika, Ruiru and Nairobi. Thus, they act as an opportunistic agent in this chain (Williamson, 1985), and earn nonpunishable rent by buying avocado at a low price and selling at a higher market prices.

Export marketing activities in Murang'a are governed by contractual trade relationships (Mwambi *et al.*, 2016). Farmers do not always possess full information on price, demand, market trends and the available trade opportunities in the international market; therefore, to maximize their decision making they form marketing organizations (Catherine, 2017; Zylberberg, 2013). These institutions help farmers to reduce bounded rationality that farmers would have while gathering information on price and market demand conditions (Simon, 1957). Also, the farmer market organization curbs the uncertainty that surrounds the trade transaction between the smallholders and the avocado traders, such as price variations. Farmer organization allows government support services, such as the supply of improved

avocado seedlings, capacity building, and post-harvest management services that improve avocado productivity (Catherine, 2017). Regarding asset specificity, farmers have little asset investment costs in export marketing. In most cases, processors have invested in specialized transport facilities, cold rooms, and avocado processing plants. However, farmers indirectly incur this cost while marketing in the export marketing chain, such as the delayed time of transaction and also payment delays (De Souza Filho and Miranda, 2019).

Exporters purchase avocados that are of high quality and grade. The major exporters in the area are Kakuzi limited, Vegpro, Sunripe, Kenya Horticultural Exporters (KHE), and East African Growers (EAG) and Ideal Matunda, Keitt (Amare *et al.*, 2019). These exporters obtain avocado from contracted farmers either directly from the farmers or from the collection centers run by the farmer organizations

2.3 Conceptual framework

Based on the concept of transaction cost theory by Coase (1937), farmers' participation in the export market is constrained by transaction costs incurred during marketing such as information search costs, traveling costs to buyers location, farmer marketing organization membership cost (negotiation costs), farmer marketing organization subscriptions (monitoring costs) and harvesting cost i.e. behavioral uncertainty costs (Seggie, 2012). Information search cost, traveling cost to buyers location and negotiation costs were expected to occur before the transaction with the export buyer (*ex-ante costs*) while monitoring cost was considered as *ex-post costs* i.e those that occur after the farmers have signed contracts with the export buyer (Brouthers, 2002). Further, harvesting cost was expected to trigger the behavioral uncertainty that the avocado farmer would not predict the behavior of pickers, which increased the cost of hiring pickers, sorting and grading the produce for the export market (Seggie, 2012). All these costs were deemed to limit avocado farmers' participation in export marketing. It was also assumed that an avocado farmer would not participate in a given market when transaction costs incurred in that market outweigh the benefits received from the market (Musemwa *et al.*, 2008).

The theory of transaction cost is explained by the use of the Heckman two-stage model by Key *et al.* (2000). Further, the study argued that fixed transaction costs influence smallholder farmers' market participation while proportional transaction costs affect both market participation and extent of participation. Heckman's two-stage model developed by Heckman (1979) has shown good results by studies investigating transaction costs and market participation (Alene *et al.*, 2008; Ouma *et al.*, 2010; Bwalya *et al.*, 2013; Muricho *et al.*, 2015). Therefore this framework was used to conceptualize the role of transaction costs on farmer's decisions in export market participation and extent of participation (Figure 1).

Figure 1 indicates that transaction costs influence smallholder farmers' participation in the market. It was expected that market participation was either in the export market or in the local market. The high-quality avocados were sold in the export market while the low-quality ones rejected in the same market were sold in the local markets to maximize the returns.

3. Methods

This research was conducted in Murang'a County located at the Central Highlands of Kenya, which lies between latitudes 0° 34′ and 107′ South and longitudes 36 and 37° 27′. The County occupies an area of 2558.8 square kilometers (Murang'a County Development Plan, 2018). The main agro-ecological zones in occupied are upper midland agro-ecological zone (UM) with some traces of lower midland (LM). Murang'a County was selected for the study since it is the leading producer of avocados in Kenya with a production of up to 120,645 tons annually, and the area under avocado farming is estimated to be 4,319 hectares (USAID, 2017). Seven key avocado producing locations were selected for the study, namely, Kigumo, Kagunduini,

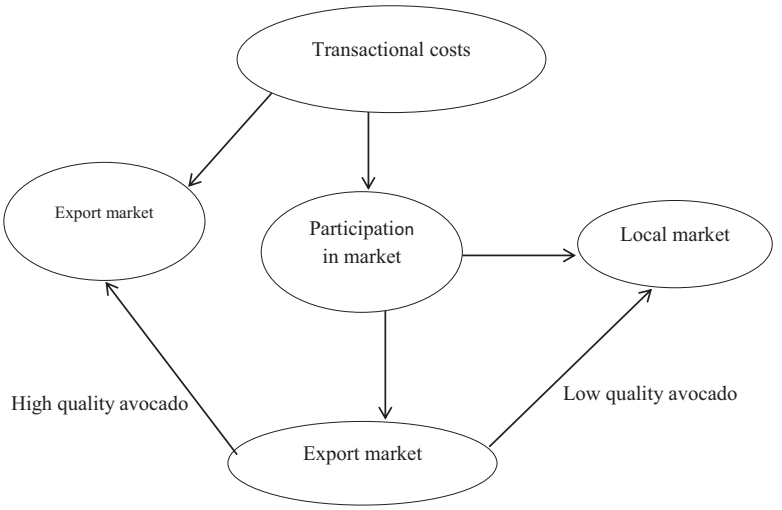

Figure 1.
Conceptual framework

Ruchu, Gaichanjiru, Ithiru, Muruka and Ng'araria. There are two avocado seasons in the study area, with the long season running from March to August and the short season running from October to December (Amare *et al.*, 2019). The data was collected during the long season of March to August 2019.

3.1 Sampling design and procedure

The study used a stratified sampling technique to collect data from 384 smallholder avocado farmers. The first step involved identifying the seven avocado producing locations in Murang'a County. The second one involved selecting seven sublocations randomly from the identified locations. Proportionate to size formula was applied to determine the total number of farmers to be interviewed in each village, the total population of farmers in each village was divided by the total number of farmers in the selected villages and then multiplied by the expected sample size (384 smallholders avocado farmers). Finally, the interval between the farmers to be interviewed was estimated by dividing the total number of farmers in the village by the required number of farmers.

For the analysis purposes, this study followed export marketing. However, farmers generally sell the best quality of avocado in the export market, and the low quality is sold in the domestic market to reduce price risk. Therefore, to distinguish participation in the two market proportions of avocado sold was used, where farmers who made sales in the export market were considered as participants, while those who did not sell any amount of avocado in the export market were nonparticipants.

3.2 Transactional costs measurement

The study considered two types of transactional costs. Firstly, costs attributed to the amount of produce marketed referred to as proportional transactional costs (Macharia *et al.*, 2014; Mabuza *et al.*, 2014). These included harvesting costs i.e. behavioral uncertainty cost (Seggie, 2012), secondly, Fixed transactional costs measured in terms of cost of information search, negotiation cost (farmer marketing organization joining fees) and monitoring cost that is farmer marketing organization subscriptions (Jagwe, 2011; Seggie, 2012; Mabuza *et al.*, 2014; Maina *et al.*, 2015; Cuevas and Clarete, 2015). Therefore, in relation to measuring the

transactional costs in the export market, the cost of information search, traveling costs to buyers' locations, farmer organizations' membership fee, subscription charges, and harvesting costs were considered.

3.3 Empirical model

This paper used Heckman (1979) two-stage model in the analysis. The Heckman model assumes that one or more variable(s) must appear in the selection equation (selection variables) but not in the outcome equation (Alene *et al.*, 2008; Bwalya *et al.*, 2013; Goetz, 1992). In this case, fixed transactional costs were assumed to affect Heckman's first regression equation, while proportional transactional costs were assumed to affect the extent of participation. The extent of participation was observed for only farmers that participated (i.e. export market participation = 1) but was unobserved for nonparticipants in the export market, i.e. zero sales in the export market. Also, the farmer's decision on export market participation and extent of participation was expected to occur simultaneously. Therefore, these assumptions made the Heckman model be the most appropriate model for the study over other regression models, such as the Tobit model and the double hurdle model. Inconsistent standard errors in the estimated parameters were corrected by the use of the Heckman sample selection procedure in Stata software, which corrects the problem automatically (Clougherty *et al.*, 2016). Similarly, the likelihood of the Inverse Mills Ratio (IMR) being collinear with the second stage equation was corrected by including more predictors in the first stage that were excluded in the second stage (Certo *et al.*, 2016). Thus, the first stage of the model and the second stage were specified as:

Stage 1

$$\mathrm{Pr}_{\mathrm{EMP}} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_n X_n + \varepsilon_i^* \tag{1}$$

where $\mathrm{Pr}_{\mathrm{EMP}}$ is the probability of export market participation, β_0 is constant, β_1 to β_n are parameters to be estimated, X_1 to X_n are the vector of transaction costs and factors while ε_i is an error term.

And

$$\mathrm{Pr}_{\mathrm{EMP}} = 1 \text{ if } > 0$$

$$\mathrm{Pr}_{\mathrm{EMP}} = 0 \text{ if } \leq 0$$

Stage 2

$$Y_i = \beta_o + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_n X_n + \varepsilon_i \tag{2}$$

where Y_i is the proportion of avocado sold in the export market, β_o is constant, β_1 to β_n are parameters to be estimated, X_1 to X_n are the vector of transaction costs. ε_i is an error term.

3.4 Variable description

Table 1 shows the study variables, their description and how they were measured.

4. Results and discussion

4.1 Preliminary test

Multicollinearity test was applied using the correlation matrix to check for multicollinearity problem within the explanatory variables. The rule of thumb is that if the pairwise correlation of explanatory variables is greater than 0.5, the multicollinearity problem exists (Gujarati and Sangeetha, 2007). The results showed that no multicollinearity problem that was present (Appendix).

Variable	Description	Measurement
Export market participation	Export chain or domestic market	1 = export market 0 = domestic market
Extent of participation	The proportion of avocado sold in the export market per season	Kilograms/season
Information search cost	Amount used on airtime to call buyers per season	KES
Farmers traveling costs to buyers location	Amount used to travel to buyers' location per season	KES
Negotiation costs		
Farmer marketing organization membership fee	Amount paid when registering farmer marketing organization	KES
Monitoring cost		
Farmer market organization subscription	Amount paid for contract monitoring per season	KES
Behavioral uncertainty		
Harvesting cost	Amount paid to avocado pickers per season for picking, sorting and grading avocado	KES
Age	Age in years	Number of years
Experience	Number of years spent in avocado marketing	Number of years
Family size	Number of people in a household	Number of people
Farm size	The size of land owned	Number of hectares
Farm gate price	Price of avocado per kilogram	KES /Kg
Number of avocado trees	Number of avocado trees under production stage	number of trees
Education	Years spent in formal education	years
Farm Income	Total farm income per year	KES
Intercropping avocado with coffee	If farmer has intercropped avocado with coffee	1 = Yes 0 = No
Intercropping avocado with macadamia	If farmer intercropped avocado with macadamia	1 = Yes 0 = No
Checks on avocado size	If the buyer checks on size of the avocados	1 = Yes 0 = No
Training	Whether farmer was trained on avocado farming methods	Number of agricultural training on avocado farming methods
Access to market information	Whether the respondent has access to market information	1 = Yes 0 = No
Payment delays	Days taken to receive payment after collecting avocado	Number of days
Delayed collection avocados	Whether the preferred buyer delayed collecting avocados	1 = Yes 0 = No
If buyer offers better price	Whether the buyer offered better price	1 = Yes 0 = No
Membership to a marketing organization	Belonging to a marketing group	1 = Yes 0 = NO
Distance to the local market	Distance to the local market	KM

Table 1.
Variable description

4.2 Descriptive statistics on farmer characteristics

The avocado farmer characteristics in the export and domestic market were analysed. The results are given in Table 2. The comparative analysis showed that the mean family size for household heads participated in the export market was 4.6 while in the domestic market, it was 5.2. These results were significant, indicating that export market participants had

Farmer characteristics		Export market $n = 106$	Domestic market $n = 278$	Pooled data $N = 384$	t/χ^2 test
Family size		4.76	5.21	4.99	2.15 (0.03)**
Age (years)		64.38	59.06	61.72	3.26 (0.00)***
Education (years)		7.35	7.02	7.11	0.71 (0.47)
Marketing experience (years)		17.25	12.84	14.05	5.01 (0.00)***
Farm annual income per year (KES)		190300.50	89373.02	117233.20	3.74 (0.00)***
Farm size (ha)		0.96	0.59	0.70	6.18 (0.00)***
Number avocados trees		22.49	14.84	16.95	3.32 (0.00)***
Gender (%)	Female	16.98	22.66	21.09	
	Male	83.02	77.34	78.91	1.48 (0.22)
Sources of off-farm income (%)	Business	12.26	16.91	15.63	
	Salary	2.83	7.19	5.99	2.27 (0.52)
	Casuals	0.00	4.32	3.13	
Access to market information (%)	Yes	98.11	97.84	97.92	29.39 (0.00)***
	No	1.89	2.16	2.08	
Number of agricultural training		2.75	0.58	1.18	14.52 (0.00)***

Note(s): *** and ** indicate significance at 1 and 5% level respectively, χ^2 is chi-square, 1 USD = 101.29 KES

Table 2.
Farmers characteristic

smaller household sizes than those who trade in the domestic market. The average age for household heads participating in export marketing was higher (64.38 years) than ones in domestic marketing (59.06 years). The findings reveal that more elderly farmers are likely to sell in the export market while younger farmers participated in the domestic markets. This result corroborates with Adabe *et al.* (2019), who reported that export market participants had a higher mean age than nonparticipants. The analysis further showed that household head trading in the export chain had significantly higher market experience (17.25 years) than domestic market participants (12.84).

Mean farm income for household heads in the export market was found to be higher (KES 190300.50) than in the domestic market. This is because the export market chain offers a competitive price that leads to increased farm income. The mean farm size was larger (0.96 Ha) for export participants than nonparticipants implying that ownership of larger land size increases the quantity of avocado produced, which increases marketable surplus to the export market. The average number of trees owned by farmers in the export market was found to be 22 trees. These findings were also significant hence showing that farmers' in the export market had considerably more avocado trees under the production as compared to those trading in local chains.

Regarding access to market information, the analysis showed that 98.11% of farmers in the export market had access to market information, while 97.84% of domestic farmers also had access to information on avocado marketing. Farmers in the study area had access to various radio, phone sms and television programs tailored to broadcast information on agribusiness farming that increases their knowledge about avocado farming. Annor *et al.* (2016) noted that access to the information on markets enables farmers to be aware of current market requirements in the export market e.g sanitary and phytosanitary requirements. Results further revealed that the agricultural trainings on avocado farming methods attended were significantly higher for export market participants (2.75) but low for nonparticipants (0.58), implying that increased agricultural training may increase farmers' knowledge on export market standards.

4.3 Descriptive statistics on market factors

Market factors results (Table 3) showed that the mean farm gate price in the export market was significantly higher (KES 64.53) than in the domestic market (KES 28.72). This is because the international market generally offers higher product market. The mean quantity of avocado sold was higher under export marketing (2275.15 kg) compared to that of the domestic market (1556.90 kg), implying that the marketed avocado in the export market was significantly more than in the local market. The distance to local markets was higher among export market participants (7.45 Km) as compared to nonparticipants (6.14 Km). These results showed that increased distance to local markets increases the chances of participating in export marketing.

Approximately 92.45% of farmers in the export market indicated that they prefer the buyers because of a better price. These findings imply that better prices attract farmers to participate in the export market. In addition, 18.87% of farmers in the export market indicated that there was delayed buying of avocado by the preferred buyers. The same was true in the domestic market at 72.66%. Delayed buying of avocado prompts farmers to participate more in the local markets than in the export market. The average payment period in days for avocado delivered among participants in export marketing was 1.73 days while in the domestic market was found to be one day. This shows that export buyers took a longer time to pay farmers for avocado delivered, but the domestic market buyers most cases pay within one day.

The results further showed that buyers in the export market require farmers to belong to well-organized marketing organizations (79.25%), which are not the case in the domestic market. These institutions play a vital role in coordinating the trade between avocado farmers and exporting companies. Farmers' are trained on good agricultural practice for the production of avocado that meets Global GAP standards for the groups. Membership also facilitates collective buying of inputs and ultimately reduces transactional costs at the export market.

4.4 Descriptive statistics on transactional costs among avocado farmers

Transactional costs results in Table 4 showed that the mean cost of information search was higher in the export market (KES 45.94). The findings revealed that there was a significant

Market factor		Export market $n = 106$	Domestic market $n = 278$	Pooled data $N = 384$	t/χ^2 test
Farm gate price per kg		64.53	28.72	37.68	57.60 (0.00)***
Quantity sold per season (Kgs)		2275.15	1556.90	1755.17	3.65 (0.00)***
Dista1nce to the local market (KM)		7.45	6.14	6.50	2.21 (0.03)**
Reasons for choice of the buyer					
Offer better price (%)	Yes	92.45	5.40	29.43	280.05 (0.00)***
	No	7.55	94.60	70.57	
Preferred buyer delayed buying (%)	Yes	18.87	72.66	57.81	91.05 (0.00)***
	No	81.13	27.34	42.19	
Payment period for avocado delivered (days)		1.73	1.00	1.200	27.10 (0.00)***
Things that buyer looks at					
Checks at size of avocado (%)	Yes	99.06	96.76	97.40	1.59 (0.21)
	No	0.94	3.24	2.60	
Must be in marketing organizations (%)	Yes	79.25	0.00	21.88	349.61 (0.00)**
	No	20.75	100.00	78.13	

Note(s): *** and ** indicate significance at 1 and 5% level

Table 3.
Market factors

Table 4. Transactional costs in export and local markets

	Export market $n = 106$	Domestic market $n = 278$	Pooled data $N = 384$	t-test
Transactional costs				
Cost of information search per season (KES)	45.94	5.43	16.61	10.38 (0.00)***
Traveling cost to buyers location per season (KES)	444.81	94.53	191.22	5.01 (0.00)***
Farmer Organization Membership Fee per season (KES)	100.00	0.00	100.00	1.57 (0.12)
Farmer organization Subscription charges per season (KES)	100.00	0.00	100.00	1.17 (0.24)
Harvesting cost per season (KES)	2103.06	6817.92	8114.74	10.63 (0.00)***

Note(s): *** and ** indicate significance at 1 and 5% level

difference between information search costs for farmers who participate in the export market and domestic markets. Further, the results indicate that traveling costs to the buyers' location was high for export participants. These results imply that farmers incur costs in terms of bus fares as they make trips to buyers' locations to attend trainings on farming methods and also obtain information on the price and market demand. The mean harvesting costs per season were higher for farmers' participating in the domestic market than in the export market (KES 2103.06), hence implying that those selling in the domestic market are likely to incur higher costs of harvesting since farmers are unable to predict the behavior of pickers, which then increases the costs of hiring and supervising them.

4.5 Role of transactional costs on export market participation

The Heckman two-stage model was run to estimate the role of transactional costs on export marketing participation. Results of the selection stage are shown in Table 5, while those of the second stage analysis are shown in Table 6. The Inverse Mills Ratio (IMR) was positive and significant at 5% level. This indicates that the error term in the selection results and the truncated OLS regression results are positively correlated. The marginal effects were used for interpretation since they have a direct interpretation, unlike the coefficients that are values that maximize the likelihood function (Heckman, 1979).

The findings indicated that the cost of information search reduces the probability of farmer's participation in the export market by 0.01%. This cost was captured as the total airtime used to call buyers. Therefore, these results showed that the increased cost of airtime spent to call buyers decreased the likelihood of participating in the export market. These results are similar to those found by Jagwe (2011), Mabuza *et al.* (2014), Macharia *et al.* (2014), which revealed that the cost of information search negatively affects farmers' participation in agricultural marketing.

Distance to the local market increased the likelihood of participation in the export market by 0.13%. Farmers nearer to local markets have many alternatives as compared to those in far distances. Mwambi *et al.* (2016) noted that being close to the market confers an advantage to the households since they have many alternatives than households located in the peripheries. Findings of Abayneh and Tefera (2013); Kyaw *et al.* (2018); Mariyono (2019) indicated a negative relationship between distance to market and the market participation. However, in this case, there is a positive relationship between distance and farmer participation in the export market. Buyers in the export market collect avocado directly from the farms, thereby reducing the distance to market that farmers would have transported their produce, hence increasing the farmers' likelihood of participating in export marketing.

Export market participation	Marginal effects	Coef.	Std. err	*Z*	*P*>|*z*|
Transactional costs					
Cost of information search (KES)	−0.0001	−0.0005	0.0002	−2.4900	0.0130***
Traveling cost to buyers' location per season (KES)	$-0.0002e^{-2}$	$-0.0007e^{-2}$	$0.0001e^{-1}$	−0.6600	0.5070
Farmer organization membership fee per season (KES)	−0.0001	−0.0002	0.0001	−0.1410	0.1590
Harvesting cost per season (KES)	$-0005e^{-1}$	$-0.0002e^{-3}$	$0.0008e^{-3}$	−0.2100	0.8300
Distance to local market (Km)	0.0013	0.0049	0.0016	3.0700	0.0020***
Type of road	0.0033	0.0129	0.0097	1.3300	0.1820
Farmer characteristics					
Age in years	0.0001	0.0006	0.0008	0.7500	0.4520
Education in years	0.0021	0.0082	0.0031	2.7100	0.0070***
Experience in avocado marketing (years)	0.0005	0.0018	0.0012	1.5800	0.1130
Family size (number of households)	0.0001	0.0004	0.0057	0.0700	0.9410
Farm size (Ha)	0.0021	0.0082	0.0190	0.7800	0.4380
Farm income (KES)	$-0.0002e^{-5}$	$-0.0008e^{5}$	$0.0004e^{-2}$	−0.3900	0.7000
Number of avocado trees	−0.0002	−0.0006	0.0005	−1.3500	0.1750
Farm gate price (KES)	−0.0001	−0.0004	0.0004	−0.9700	0.3300
Sources of off farm income	0.0018	0.0069	0.0044	1.5500	0.1210
Intercropping avocado with coffee (0 = No, 1 = Yes)	0.0108	0.0418	0.0171	2.4500	0.0140***
intercropping avocado with macadamia (0 = No, 1 = Yes)	0.0503	0.1949	0.0331	5.8800	0.0000***
Membership to farmer organizations	0.0110	0.0426	0.0180	2.3700	0.0180**
Training on avocado farming	0.0131	0.0506	0.0264	2.9200	0.0550*
Access to market information	0.0363	0.1405	0.0411	3.4200	0.0010***
Market factors					
Delayed collection of avocados	−0.0020	−0.0076	0.0195	−0.3900	0.69600
If the buyer offer better price	0.0085	0.0330	0.0264	1.2500	0.2110
Payment delays for avocado delivered	0.0005	0.0018	0.0171	0.1100	0.9140
Checks on avocado size	0.0869	0.3370	0.0553	6.1000	0.0000***
Inverse mills ratio		0.0647	0.0278	2.3300	0.0200**

Note(s): *** and ** indicate significance at 1 and 5% level

Table 5.
Heckman first stage Regression Results

With regard to farmer characteristics hypothesized, results showed that household level of education in years positively affects farmers' decisions on export market participation. A one year increase in the household heads' level of education increases the probability of farmer's participation in the export market by 0.21%. The plausible explanation is that farmers with higher levels of education are able to search for market information related to avocado at ease, thereby increasing their likelihood to participate in export marketing. This finding is consistent with findings of Sigei *et al.* (2014), Adeoti *et al.*, (2014), Cuevas and Clarete (2015) that found a positive relationship between education and farmer's market participation; however, they contradict the findings of Anthon *et al.* (2016).

Further, intercropping coffee trees with avocadoes positively affected participation in the export market. Having coffee-avocado intercrop increases the likelihood of export market participation by 1.08%. Findings also show that intercropping avocado with macadamia increases the probability of export market participation by 5.21%. This could be explained by the fact that income received from the sale of macadamia nuts and coffee is used to meet some

Table 6. The results of second stage Heckman OLS regression analysis

The proportion of avocado sold in export market (Kgs)	Coef.	Std. err	*Z*	*P*>|*z*|
Transaction costs				
Harvesting costs (KES)	$-0.0002e^{-1}$	$0.0009e^{-2}$	−2.1500	0.0320**
Distance to nearest market (KM)	0.0235	0.0157	1.4900	0.1360
Road type	−0.0345	0.1046	−0.3300	0.7410
Farmer characteristics				
Age in years	−0.0106	0.0052	−2.0200	0.0430**
Education in years	−0.0550	0.0278	−1.9800	0.0480**
Experience in avocado marketing (years)	0.0254	0.0113	2.2500	0.0240**
Family size	−0.1620	0.0456	−3.5500	0.0000***
farm size (Ha)	0.5072	0.1644	3.0900	0.0020***
Farm income	$0.0005e^{-2}$	$0.0001e^{-2}$	4.6600	0.0000***
Intercrop avocado with coffee	0.2483	0.1877	1.3200	0.1860

Note(s): *** and ** indicate significance at 1 and 5% level

of the transactional costs incurred in the export market. In addition, the same farmer marketing organization used for avocado marketing is also used to help farmers market the coffee and macadamia outputs; thus, farmers having macadamia and coffee in most cases would also grow avocado. This is in line with the findings of Kondo (2019), who found that crop diversity positively affects farmers' market participation.

Membership in farmer organizations increased participation in the export market by 1.10%. This implies that farmer organizations promote the networking of farmers in agricultural marketing, therefore promoting ease of access to marketing services. This agrees with Okoye *et al.* (2016) and Kyaw *et al.* (2018), who found that being a member of a farmer cooperative had a significant and positive effect on market participation.

Trainings on avocado farming methods significantly and positively affected farmer's participation in export markets by a probability of 1.31%. This means that training on avocado farming methods, such as organic avocado farming increases productivity and quality standards of the product, thereby increasing participation in the export market. Similar findings were reported by Ingabire *et al.* (2017); Cuevas and Clarete (2015) found a positive relationship in agricultural training received and farmer's market participation.

Access to market information positively affected farmers' participation in the export market by 3.63%. This is because market information is useful in analysing market situations, especially with respect to market prices and the level of market demand for their produce (Osebeyo and Aye, 2014). This is in line with Yohannes *et al.* (2014), Osebeyo and Aye (2014), and Kyaw *et al.* (2018), who found the existence of a positive relationship between access to market information and market participation.

Regarding selected market factors, the analysis showed that avocado size positively affects export market participation by probability 8.69%, hence implying that the size of avocado harvested is integral when in the export markets. This is because packing and grading of avocados for export market depend on the size of an avocado. Similar findings have been reported by Oyekale (2014), that the size of produce positively affects farmers' participation in markets.

It was also noted that delayed collection of avocado although not significant, had a negative coefficient, which implies that it negatively affects participation in the export market. Other studies found it to be significant for instance studies by Sathapatyanon *et al.* (2018), Macharia *et al.* (2014), who indicated delayed payments affect participation in agricultural marketing. In our case, delayed payment was not significant because the delay was not that long, the average waiting time for fruits to be collected and receipt of payment was found to be 2 days (Table 3).

4.6 Role of transactional costs on the extent of export market participation

The results of the second stage of Heckman OLS regression results presented in Table 6 explain the role of transactional costs on the extent of participation in the avocado export market.

The analysis showed that harvesting cost negatively affected the proportion of avocado sold in the export market. This means that all other factors held equal, an increase in harvesting cost by 1 unit reduces the proportion of avocado sold in the export market by 0.002%. This cost included the cost of picking, sorting and grading avocados at the time of harvesting. Similarly, Macharia *et al.* (2014) reported that costs such as sorting and grading reduce the proportion of output sold in the markets.

With regard to farmer characteristics, age in years was found to have a negative effect on the proportion of avocado sold in the export market. The age of the household head reduces the proportion of avocado sold in the export market by 1.09%. This was explained by the fact that elderly farmers may be reluctant to adopt new methods of avocado farming hence reducing the output marketed in the export market. Revealed that there was a negative relationship between age in years and the extent of farmer participation in marketing. On the contrary, Harrizon *et al.* (2016) found a positive relationship between age and the extent of participation.

Household heads' level of education had a negative effect on the proportion of avocado sold in the export market by 5.50%. The possible explanation for this observation is that more educated household heads are probably attracted to other jobs other than avocado farming, which subsequently reduces the intensity of participation in export markets. Such findings were reported by Mariyono (2019); Kumar *et al.* (2018) that education has a negative effect on market participation. However, education level positively affects the extent of market participation, as indicated by Harrizon *et al.* (2016) and Adeoti (2014).

Experience in avocado marketing positively affects the extent of export market participation. An increase in experience on avocado marketing by one year increases the proportion of avocado sold in the export market by 2.54%. This indicates that years spent in avocado farming have a positive relationship with the proportion sold to the export market. Farmers with higher levels of market experience understand the market dynamics, which help them make appropriate decisions on the quantity sold to the export. A study by Adepoju *et al.* (2019) found that market experience positively affects the amount sold in the market.

The analysis further showed that family size affects the proportion of avocado sold in the export market by 16.20%. Family size may have two opposing effects; as family size increases there is a high demand for food, which reduces the amount of output marketed. In this study, increased family size means high demand for food that make households sell some fruits in the local markets, which could have been sold in the export market, hence, reducing the extent of participation in export marketing. On the other hand, an increased amount of produce marketed may imply a high labour supply in production by family members (Mugisha *et al.*, 2013). These findings concur with the results of Henson *et al.* (2013), Apind *et al.* (2015), Tura *et al.* (2016), who reported a negative effect between family size and extent of market participation.

Farm size showed a positive effect on the proportion of avocado sold in the export market, where a change in farm size increased the proportion of avocado sold in the export market by 50.72%. Land is the main production asset that has a direct bearing on the production of marketable output. Household heads in the export marketing chain had relatively large farm sizes and area under productive avocado trees (Table 2), thereby explaining the role of land on the extent of participation in the market. Findings by Abayneh and Tewodros (2013), Tura *et al.* (2016), Adepoju *et al.* (2019) also revealed that farm size positively affects the amount of output sold in the market.

The total farm income positively affects the extent of participation in the export market, indicating that an increase in farm income by one shilling increases the proportion of avocado sold in the export market by 0.0005%. This is explained by the fact that improved total farm income is used by farmers to meet some of the transaction costs involved in marketing. This is explained by Osmani and Hossain (2015), who found that increased in farm income enhanced farmers' extent of market participation.

5. Conclusions and recommendations

Transactional costs are vital with regard to participation in export markets among smallholders in Sub-Saharan Africa, Kenya included. This paper investigated the role of transaction costs on smallholders' avocado participation in the export market and the extent of participation in Murang'a County, Kenya. The results showed that the cost of information search was an important variable that impedes smallholders' participation in export marketing while harvesting costs inhibits the extent of participation in export marketing. Research-based insights on transactional costs and export marketing in other perishable fruits such asmangoes would be important in promoting smallholders' participation in lucrative markets.

Based on the key findings, the following recommendations were made. First, timely market information should be provided to the smallholder avocado farmers participating in the export market. This information may include avocado produce collection dates that will reduce airtime used to call the export produce collectors. Second, the introduction of avocado harvesters through farmer marketing organizations can play a vital role in reducing harvesting costs. These technologies would help in decreasing the cost of picking, sorting and grading avocados for export market standards. They will also reduce the incidences of fruit loss due to handling damages caused by hand pickers.

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Appendix

	Off farm	Farm size	Having ma	Organization	Trainings	Delayed buying	Better price	Payment delays	Size	Market information	Information
Off farm	1.00										
Farm size	−0.08	1.00									
Having macadamia	−0.08	0.19	1.00								
Organization membership	−0.18	0.08	−0.06	1.00							
Trainings	−0.09	0.18	0.13	−0.01	1.00						
Delayed buying	0.01	−0.11	−0.24	0.08	0.11	1.00					
Better price	0.10	0.04	0.11	−0.06	0.10	−0.04	1.00				
Payment delays	0.05	−0.04	−0.18	0.29	0.05	0.59	−0.05	1.00			
Size	−0.04	0.10	0.14	−0.05	−0.02	0.05	0.34	0.07	1.00		
Market information	0.15	0.13	0.05	−0.07	0.30	0.07	−0.04	0.09	−0.01	1.00	
Information search cost	0.06	0.05	−0.11	0.15	−0.02	0.21	0.03	0.20	0.20	0.09	1.00
Price	0.10	−0.16	−0.05	−0.04	0.18	0.32	0.43	0.23	0.36	0.10	0.17
Membership fee	0.11	−0.08	−0.12	0.20	0.03	0.11	0.00	0.15	0.06	−0.08	0.05
Age	0.09	0.35	−0.12	0.02	−0.14	−0.17	0.09	−0.29	0.18	−0.10	0.05
Education	−0.23	0.01	0.20	0.20	0.19	0.02	−0.02	0.16	0.13	0.07	0.19
Experience	0.12	0.22	−0.08	0.13	0.00	0.32	0.12	0.19	0.13	−0.21	0.09
Traveling cost	−0.10	0.18	0.02	0.07	−0.08	0.00	−0.03	−0.24	0.06	−0.26	0.11
Distance	0.32	0.00	0.05	−0.45	−0.19	0.02	0.11	−0.23	−0.07	0.02	0.02
Income	−0.01	0.13	0.14	0.06	0.06	−0.04	0.07	−0.05	0.03	0.04	0.11
Family size	0.06	0.04	−0.14	0.00	0.17	0.09	0.00	0.10	−0.02	0.08	0.20
Coffee intercrop	−0.10	0.39	−0.04	0.07	0.06	0.07	−0.34	−0.11	−0.14	0.10	0.11
Road type	0.28	−0.13	−0.14	0.11	0.05	0.23	−0.15	0.04	−0.09	−0.03	0.11
Harvesting cost	−0.04	0.35	0.01	0.07	0.10	−0.17	0.15	−0.12	0.10	−0.04	0.19

(continued)

Table A1.
Correlation matrix

Table A1.

	Price	Membership fee	Age	Education	Experience	Traveling cost	Distance	Income	Family size	Coffee intercrop	Road type	Harvesting
Off farm												
Farm size												
Having macadamia												
Organization membership												
Trainings												
Delayed buying												
Better price												
Payment delays												
Size												
Market information												
Information search cost												
Price	1.00											
Membership fee	0.08	1.00										
Age	−0.03	0.06	1.00									
Education	0.03	0.02	0.47	1.00								
Experience	0.11	0.16	0.36	−0.25	1.00							
Traveling cost	0.02	−0.08	0.13	0.04	0.10	1.00						
Distance	0.12	−0.10	0.23	−0.37	0.17	0.28	1.00					
Income	−0.03	0.14	−0.03	0.33	0.10	−0.01	0.05	1.00				
Family size	0.02	−0.07	−0.13	0.20	0.19	0.03	0.03	0.20	1.00			
Coffee intercrop	−0.23	0.11	0.24	−0.09	−0.09	0.25	−0.01	0.14	−0.11	1.00		
Road type	0.03	0.23	0.01	−0.16	0.15	0.12	0.14	−0.11	0.03	0.04	1.00	
Harvesting cost	−0.02	0.08	0.11	0.09	0.05	0.07	−0.07	0.26	0.10	0.13	−0.06	1.00