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Effect of land tenure security on women's empowerment in Narok County, Kenya

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Abstract

Land is an essential factor of production that determines the agricultural transformation of any country. However, women's access to land rights in developing countries is still limited. To analyse the effect of possession of land rights on women's empowerment among rural women in Kenya, cross-sectional primary data was collected from 366 women participants selected using a multistage sampling procedure. Descriptive statistics show that women with land rights were more empowered, younger, more educated and owned more land than those without land rights. The results of the two-stage least squares model suggest that possession of land rights increases women's empowerment by about 0.25%. Other factors affecting women's empowerment include marital status, gap in level of education, ownership of oxen, being in a polygamous marriage, off-farm income, group membership and access to credit. These findings underscore the need to formulate policies that facilitate women's access to land rights in rural areas, thus improving their empowerment.

Key words: endogeneity, gender equality, land rights, two-stage least squares, women's empowerment

1. Introduction

Globally, land is a key asset in agricultural communities, where its accumulation influences their social, political and economic power (Agarwal 1994). Ownership of land rights could have a bearing on the promotion of the welfare of rural poor households who depend on agriculture for their livelihoods (Sen 2001). It therefore is a serious policy challenge if there is a disparity in the ownership of land rights between men and women. Gender imbalance in the ownership of land and other productive assets is one of the main reasons for continued economic, social and political discrimination in the world (Khan *et al*. 2016). In sub-Saharan Africa and Asia, women own relatively less land than men, even though research shows they work harder on farms than men (Doss *et al*. 2015, 2018; Balasubramanian *et al*. 2019). A study by Lambrecht (2016) in Ghana found that women who were farming owned relatively smaller farm sizes than men. Similarly, even though more women than men were engaged in agriculture in Nepal, only 19% owned land (Mishra & Sam 2016); these findings underscore the need to provide secure land rights to women as a development ingredient.

Previous studies have shown that improving women's possession of secure land rights is a crucial element in attaining improved gender equality (Doss 2013; Mishra & Sam 2016). Furthermore, Menon *et al*. (2014) state that improving the possession of land rights for women would have far-reaching benefits, such as improved health and welfare of children due to improved bargaining power. Providing women with secure land rights would also improve their access to credit facilities to invest in entrepreneurial ventures. Menon *et al*. (2014) suggests that resources in terms of parcels of land owned by women are more likely to benefit children than those owned by men. In addition, intra-household spending patterns improve when women are granted possession of secure land rights in the household (McElroy & Horney 1981). Customary, religious and statutory laws governing the use of land and the transfer of property in most developing countries have been fronted as key contributors to the continued discrimination against women (Das 2016; Kieran *et al*. 2017; Quisumbing *et al*. 2018). Mahmud *et al.* (2021) indicated that, in Bangladesh, patriarchal norms restricting women's access to land are still limited and hence found no effect of access to land rights on women's income. Countries around the world have prioritised the privatisation of customary land as a way to improve women's access to land. These efforts potentially affect closing the gender land gap (Boone 2019). Recent literature from sub-Saharan Africa (SSA) and Asia (Ali *et al*. 2014; Goldstein *et al*. 2018) suggests that land registration and certification positively affect women's land tenure security.

In Kenya, the coexistence of formal and customary laws contributes to challenges in women's land ownership (Kameri-Mbote 2005; World Bank Group 2017). In addition, the discriminative aspects of customary law that disenfranchise women have remained both within households and at the community level. However, Kenya has made some progress in ensuring women's access to land rights. The country's quest to enhance land tenure security started long before independence, when it introduced land reforms by initiating a programme of land registration and processing of title deeds (titling) in the agriculture-rich areas following the Swynerton Plan of 1954 (Kijima & Tabetando 2020). Isinta and Flitner (2018) note that laws on equality in the acquisition and ownership of property, including land across gender, existed before the 2010 Constitution. For instance, the Law of Succession Act 12, passed in 1981, specifically provided equal rights of property inheritance to both women and men. The Constitution 2010 eliminates all forms of gender discrimination in the acquisition and use of property, such as land. Other Kenyan laws, such as the Matrimonial Property Act of 2012, the National Land Commission (NLC) Act of 2012, and the Land Registration Act of 2012, strive to achieve gender equality and equity in ownership of productive resources. Furthermore, under Article 2 of the 2010 Constitution, both regional and international laws that advocate for gender equality in the ownership of resources are recognised as part of the laws of Kenya (Kenay Law 2010). These include the Convention on the Elimination of All Forms of Discrimination Against Women

(CEDAW) treaty of 1979, the Beijing Platform for Action 1959, the 2002 gender policy of the Common Markets for East and Southern Africa (COMESA) and the East Africa Community (EAC) Treaty of 2000.

Despite the highlighted efforts by the government and other stakeholders to ensure that women gain possession of land rights and the potential benefits of their empowerment and household welfare in general, women still lack access to land rights, especially in rural areas. Furthermore, limited research, especially in developing countries, has attempted to establish the link between the possession of land rights and women's empowerment. This paper therefore tries to bridge the highlighted knowledge gap by examining the role of possession of land rights in the empowerment of rural women in Kenya.

The paper contributes to the body of knowledge on the following fronts. First, it does not just focus on whether women possess the land, but also whether they possess the rights to use and transfer the land, which is important, especially in rural areas where patriarchy may be high. Second, the study acknowledges the existence of reverse causality (possession of land rights affects women's empowerment and vice versa) in the analysis, causing an endogeneity problem. Therefore, the study employs an innovative econometric model (two-stage least squares method) to solve this problem. Third, the study measures women's empowerment using the Women Empowerment in Agriculture Index, designed to measure women's empowerment in the agricultural sector in rural areas. Specifically, the study focuses on the women's decision-making ability on various day-to-day agricultural activities, such as the use of resources, credit, etc. Lastly, the findings of this study contribute to the ongoing policy debate on how to achieve the fifth Sustainable Development Goal of achieving gender equality and empowering all women and girls, while at the same contributing to the achievement of goals 1 and 2 – of ending poverty and hunger, respectively. The rest of the paper is organised as follows: Section 2 presents the methodology, including the study area, sampling procedure and analytical framework. Section 3 provides the results and discussion, while Section 4 provides conclusion and policy recommendations.

2. Empirical framework

2.1 Study area and sampling procedure

The study was conducted in Narok county, Kenya, which borders Nakuru and Kajiado counties to the north and east, respectively, the Republic of Tanzania to the south, and Bomet, Migori, Nyamira and Kisii counties to the west. The county is located within latitudes 0° 50' and 1° 50' and longitudes 35° 28' and 36° 25' (County Government of Narok [CGN] 2018). Narok County consists of six sub-counties and 30 wards, with a total population of 1 057 873 persons (529 042 men and 528 831 women) in 2019, making a gender ratio of approximately 1:1 (Kenya National Bureau of Statistics [KNBS] 2019). Land ownership in the study area is categorised into three (3): community, trust and private land.

The selection of 366 study respondents followed a multistage sampling procedure. Narok County was purposively selected due to high incidence of conflicts related to land tenure insecurity (Kariuki *et al*. 2016). Sulle *et al*. (2019) argue that most women in Narok County are unaware of their land rights as set out in the 2010 Constitution, denying them the benefits of the gender-progressive land reforms. Two sub-counties (Transmara West and Transmara East) were chosen due to their highest reported cases of land-based conflicts. Two wards were chosen from each sub-county, since they had the highest number of small-scale women farmers in the sub-counties (CGN 2018). Finally, systematic random sampling was conducted using a list of small-scale women farmers obtained from the county agricultural offices. Data on socio-economic, institutional and land-related factors was collected using

pre-tested semi-structured questionnaires installed in Open Data Kit (ODK) software. Data analysis was done using Stata 15 computer software (StataCorp 2014).

2.2 Measuring the possession of land rights variable

The study used land tenure security as the main independent variable. Being a multidimensional measure, land tenure security can be measured in a number of ways. Cattaneo (2001) uses the years a household had resided on the piece of land before eviction, while Place and Otsuka (2002) use the method of land acquisition. Rao *et al*. (2016) use the probability of eviction. Land tenure systems associated with the land, that is private, communal or public land, can also be an indicator of land tenure security (Carter & Olinto 2003). Owoo and Boakye-Yiadom (2015) and Ma *et al*. (2016), on the other hand, use ownership of a title deed or land certificate as a proxy for land tenure security. However, possessing a title deed does not necessarily mean having security of tenure over land (Place & Otsuka 2000). Illegal settlers on government land have relatively secure land tenure, since they face a lower probability of eviction, yet they lack legal title over the land. Arnot *et al*. (2011) argue that, when governments are unstable, possessing a legal title may not mean anything. The various measures discussed do not explicitly capture all the aspects of land tenure security.

Due to these inefficiencies in singular measures of land tenure security, the study adopted the composite approach of Brasselle *et al*. (2002), which consists of various rights over the land. This approach appreciates the different weights each right possesses, as opposed to assigning an equal weight to all the rights, as suggested by Place *et al*. (1994). This approach suggests that security of land tenure can be assessed using three dimensions: user rights, transfer rights, and the autonomy given to the holders of rights, specifically transfer rights (Brasselle *et al*. 2002). To achieve this purpose, the study used ten types of land rights (Table 1) categorised into two broad categories (right to use and right to transfer). The frequency distribution of the land user rights (i, ii, iii, iv, v) and land transfer rights (vi, vii, viii, ix, x) are presented in Table 1. Respondents were asked whether they had permanent, transitory (temporary) or none of the user rights, while in relation to transfer rights they were asked whether they required approval from a third party to enjoy the right. This approach allowed the capturing of the different alternative roles of possession of land rights for rural dwellers (Brasselle *et al*. 2002; Ajefu & Abiona 2020).

The most prevalent land user rights were the choice of crops to grow, land fallowing (leaving land for a particular period of time without cultivating), and the right to prevent grazing; hence, they could not be used in deriving the land rights possession binary variable. Furthermore, a small number of women held less than one right. In the order of prevalence, the transfer rights that were possessed by most of the respondents were the right to inheritance of the land, the right to lease land, the right to sell the land, the right to mortgage the land, and the right to pass land on along customary lines. Thus, only user rights (iii and iv) and transfer rights were used to create the possession of rights variable, since they exhibited sufficient variations.

Table 1: Frequency distribution table of sampled households based on possession of the various land rights

Type right	%	Type of right	%
(i) Choice of crop to grow		(vi) Give land following family lineage	
No right	03.61	No right	44.35
Temporary right	14.54	Without approval	26.31
Permanent right	80.85	With approval	29.34
(ii) Leaving land fallow		(vii) Inherit land	
No right	05.63	No right	20.52
Temporary right	18.35	Without approval	45.61
Permanent right	76.02	With approval	33.78
(iii) Land development		(viii) Rent or lease land	
No right	20.21	No right	31.15
Temporary right	11.32	Without approval	40.98
Permanent right	68.47	With approval	27.87
(iv) Dispose of crop produce		(ix) Sell land	
No right	12.87	No right	40.31
Temporary right	14.13	Without approval	30.55
Permanent right	73.00	With approval	29.14
(v) Prevent grazing on the land		(x) Mortgage land	
No right	06.45	No right	40.69
Temporary right	13.15	Without approval	29.76
Permanent right	80.40	With approval	29.55
Total	**100.00**	**(366 households)**	**100.00**

The study derived a binary variable (1 if the respondent possessed land rights. and 0 otherwise) from women's possession of the different rights in the study area. The possession of the land rights binary variable was derived as follows: Category 1 (do not possess land rights) if they do not hold any transfer rights or only hold rights to inherit and to lease, or one of the two rights and not more than two user rights (whether permanent or transitory), or do not hold the latter two rights (or one of them), or have at least two permanent or transitory user rights in addition to rights (i), (ii) and (v); Category 2 (possess land rights) if, apart from the rights to inherit and to lease, they hold rights to sell land, to mortgage land, and the right to pass land on along customary/traditional lines (with or without approval), and at least two permanent rights of use in addition to rights (i), (ii) and (v).

2.3 Measurement of women empowerment variable

Women's empowerment can be measured using different proxies based on the objectives of the study. Varghese (2011), Imai *et al*. (2014), Cunningham *et al*. (2015) and Ganle *et al*. (2015) use household decision-making, economic decision-making, freedom of action, women's education level, marriage age, difference in non-labour income, and differences in mortality rate between men and women as indicators of women's empowerment. Mishra and Sam (2016) and Han *et al.* (2019), on the other hand, use autonomy in making decisions on purchasing a house, the consumption of durable goods and daily necessities, fertility choices, medical care choices, job choices, and social interaction choices as proxies for women's empowerment. However, these measures do not consider decision-making in agriculture, which is an integral part of this study. Therefore, the study adopted the Women Empowerment in Agriculture Index (WEAI) approach developed by Alkire *et al*. (2013) to measure the level of empowerment among women in the agricultural sector. WEAI is a survey-based index that uses data collected from primary individual (female) respondents living in the same household (Alkire *et al*. 2013; Sraboni *et al*. 2014). The approach consists of five domains: production, income, resources, leadership and time. These domains are divided into 11 indicators; however, the study used a revised version of six indicators developed by Malapit *et al*. (2020), as presented in Table 2. The

study specifically measured women's empowerment using the five domains, hence did not consider gender parity.

Table 2: The five domains of women empowerment

Domain	Indicator	Definition of indicator	Weight
Production	Input in productive decisions	Sole or joint decision-making over food and cash crop farming, livestock and fisheries	1/10
Resources	Ownership of assets	Sole or joint ownership of major household assets	1/15
Income	Access to and decisions on credit	Access to and participation in decision-making concerning credit	1/15
	Control over the use of income	Sole or joint control over income and expenditures	1/5
Leadership	Group membership	Whether the respondent is an active member of at least one economic or social group	1/10
Time	Workload	Allocation of time to productive and domestic tasks	1/10

Source: Alkire *et al.* (2013)

As Alkire *et al*. (2013) suggest, the study assigned a binary response to the six indicators of the five domains, indicating whether they are empowered (1) or not (0) based on the defined cut-off points. After summing up the weights, an empowerment score variable ranging from 0 to 1 was generated for the respondents. This reduced measurement errors in getting the actual level of women's empowerment. Overall, a person is empowered in the five domains if they are empowered in four of the five, or the weighted indicators reflect at least 80% total empowerment. Unlike other women's empowerment indices, WEAI can be decomposed, allowing for the disaggregation of the five domains' achievements by domain and indicator to see the areas contributing the most to women's empowerment (Malapit & Quisumbing 2015).

2.4 Model specification

Due to the nature of the outcome variable, this study can use a tobit model, since it accounts for the zero-inflated nature of the dependent variable (women's empowerment score), which is between 0 and 1. However, previous studies by Wiig (2013), Mishra and Sam (2016) and Han *et al*. (2019) suggest that there is possible endogeneity. This is due to reverse causality, which may lead to a correlation between error terms. The possession of land rights increases the level of women's empowerment, while empowered women tend to possess more rights. The ordinary least squares method would have been appropriate, but it does not account for endogeneity; thus, the study used the two-stage least squares (2SLS), an instrumental variable approach that can account for endogeneity. 2SLS is a two-stage approach that uses instrumental variables to proxy the potential endogenous variable (possession of land rights). The first stage involves the analysis of the factors influencing the possession of land rights using a probit model, as expressed in Equation (1):

$$T_i^* = \beta_0 + \beta_i X_{ij} + \varepsilon_i, \quad (1)$$

where T_i^* is a binary variable denoting possession of land rights by the woman, X_{ij} is a vector of socio-economic, land-related and institutional variables affecting the possession of land rights, while ε_i is an unobserved factor. Predicted probabilities were obtained from the results of Equation 1. The second stage involves the expression of the impact model, whereby women's empowerment is regressed against the other explanatory variables, including the predicted variable obtained in Equation (1) as an instrument for the variable, possession of land rights (walking time between homestead and the parcel of land and number of years the household had stayed on the land, as expressed in Equation (2):

$$Y_i^* = \beta_0 + \beta_1 X + \gamma T_i + \varepsilon_i, \quad (21)$$

where Y_i^* is a continuous variable that denotes the outcome variable of women's empowerment, γT_i denotes the predicted probabilities generated from the probit model in Equation (1), an instrument for the variable, possession of land rights, while ε_i is the disturbance term. X_{ij} is a vector of the explanatory variable (demographic, institutional and land-related factors) affecting women's empowerment. For the 2SLS model to be identified, the study used walking time between the homestead and the parcel of land, and the number of years the household had stayed on the land, as instruments for the endogenous variable. The Sargan test was used to test the validity of the instruments, and the results ($\chi^2(1) = 5.193$, $p = 0.3130$) indicated that the instruments were valid. The two-stage least squares approach has previously been used by Tirkaso and Hess (2018) and Mbudzya *et al*. (2017) in impact studies on food security and household income, respectively. The choice of explanatory variables in this study was informed by previous studies on women's empowerment by Alkire *et al*. (2013), Wiig (2013), Mishra and Sam (2016), Ayuya (2018), Han *et al*. (2019), Gupta and Roy (2023), Sabir and Majid (2023), Bitew *et al* (2024), Nath and Das, (2024) and Sumy *et al.* (2025)

3 Results and discussion

3.1 Descriptive statistics

Table 3 presents the results of the descriptive statistics on the variables used in the study. The results indicate that most women in the study area did not possess land rights. Furthermore, women who possessed land rights were significantly more empowered, younger and relatively more educated than those who did not. In addition, those with land rights had more household members, owned more land, had more off-farm income and stayed for a shorter time on the land compared to women who did not possess land rights. Concerning ownership of productive assets, a significant majority of those possessing land rights owned at least one ox.

Table 3: Description and descriptive statistics of variables used in the model

Variable name	Description and measurement of variables	Do not have land rights	Have land rights	Significance
Continuous variables		**Mean**		***t*-statistic**
Women's empowerment	Level of women's empowerment (Index)	0.13	0.18	-3.72***
Age	Age of the household head in years	45.36	40.92	3.53***
Education level	Years of schooling of the household head	8.80	9.90	2.57**
Age gap	Age difference in years between men and women	3.22	2.82	0.63
Education level gap	The difference in years of schooling between men and women	1.15	0.46	2.70***
Household size	Number of people in the household	4.33	4.88	-2.96***
Land size	Total land size in ha	1.35	1.84	3.12***
Market access	Walking time from the homestead to the nearest market in minutes	39.04	38.00	0.33
Road access	Walking time from the homestead to the nearest tarmac road in minutes	11.42	10.37	1.11
Extension contacts	Number of contacts respondent had with an extension agent	1.40	1.20	1.49
Land stay	Number of years the respondent has stayed on the land	18.06	14.27	3.06***
Non-farm income	Total non-farm income in KES	228 124.80	258 633.30	2.01**

Variable name	Description and measurement of variables	Do not have land rights	Have land rights	Significance
Categorical variables		**Percentage**		χ^2
Possession of land rights	% of respondents based on possession of land rights	58.31	41.69	
Marital status	% of married household heads	63.84	66.20	0.21
Community leadership	% of respondents with community leadership	16.96	13.38	0.85
Type family	% of respondents in polygamous family	4.91	2.11	1.85
Oxen ownership	% of respondents owning an ox	22.32	10.56	8.23***
Credit access	% of respondents with access to credit	54.46	54.93	0.01
Group membership	% of respondents with membership of at least one group	23.21	28.87	1.47

Note: *, ** and *** represent significance at the 10%, 5% and 1% level, respectively

Table 4 presents the results of the descriptive statistics of the five domains of women's empowerment (5DEs). The results indicate that those who had land rights spent significantly more time on primary activities than those who did not have land rights. In addition, they had significant autonomy over the use of income, and had greater input in productive decisions and the use of resources. This may imply that the possession of land rights enables women to have an opportunity to make critical decisions in the household.

Table 4: Descriptive statistics of the 5DEs

Domains	Indicator	Do not have land rights	Have land rights	Mean significance
		Mean		
Production	Input of productive decisions	0.17	0.23	0.07***
Resources	Resources	2.26	2.32	0.16***
Income	Control over use of income	1.55	1.62	1.08***
Leadership	Group membership	0.54	0.57	-0.01
Time	Time	661.10	648.21	13.061***

Note: *, ** and *** represent significance at the 10%, 5% and 1% levels respectively

3.2 Effect of possession of land rights on women's empowerment

Column 2 in Table 5 shows the ordinary least squares (OLS) results of the effect of possession of land rights on women's empowerment. The results indicate that possession of land rights significantly increases women's empowerment, by about 4.3%. However, as indicated in the methodology, a reverse relationship exists between possession of land rights and women's empowerment. We hypothesise that the possession of land rights affects women's empowerment; however, women's empowerment can also influence the possession of land rights. This results in an endogeneity problem. Therefore, the OLS estimates will be biased and inconsistent, making them unreliable for this study. In order to solve this challenge, the study used a two-stage least squares method, and the results are presented in column 3 in Table 5. The endogeneity test results (IVREG2, $\chi^2 = 5.193$, $p = 0.0022$) suggest the presence of endogeneity in the equation, hence validating the use of the 2SLS model. The model fit results (F-stat. 8.800, $p = 0.000$) indicate that the model is significant, and thus it explains the relationship between the possession of land rights and women's empowerment sufficiently. Furthermore, the uncentred R-squared suggests that the independent variables explain about 53.8% of the variations in women's empowerment.

Table 5: Results of the effect of possession of land rights on women empowerment

Variables	OLS		2 SLS	
	Coefficients	Standard errors	Coefficients	Standard errors
Possession of land rights	0.0429***	0.0122	0.2542**	0.1276
Age	-0.0009*	0.0006	0.0005	0.0011
Marital status	-0.0362***	0.0137	-0.0604**	0.0233
Years of schooling	-0.0048***	0.0018	-0.0027	0.0027
Household size	0.0115***	0.0034	0.0005	0.0080
Age gap	0.0002	0.0011	0.00009	0.0014
Education level gap	0.0031	0.0026	0.0077*	0.0045
Community leadership	-0.0124	0.0161	-0.0213	0.0221
Type of family	0.0320	0.0302	0.0841*	0.0510
Ownership of oxen	0.0302*	0.0164	0.0672**	0.0311
Land size	-0.0040	0.0041	0.00002	0.0060
Non-farm income	0.0040***	0.0011	0.0073***	0.0026
Market access	0.0001	0.0002	0.0003	0.0003
Extension visits	0.0043	0.0048	0.0051	0.0065
Group membership	0.1700***	0.0129	0.1667***	0.0173
Credit access	0.0280**	0.0119	0.0439**	0.0186
Constant	0.1005***	0.0368	-0.0541	0.1049
Number of observations	366		366	
F stat, (16, 349)	16.900***		8.800***	
Adjusted R-squared	0.411			
Uncentred R-squared			0.538	
IVREG2 – endogeneity test			5.193**	

Note: *, ** and *** represent significance at the 10%, 5% and 1% levels, respectively

The two-stage least squares results show that women's possession of land rights significantly increases their empowerment, by approximately 0.25%. Han *et al*. (2019) argue that the possession of land rights could allow land use as collateral to access credit facilities that would improve women's economic empowerment. Similarly, Mishra and Sam (2016) suggest that, by improving women's access to land, they are more likely to increase their bargaining power in the household and hence become more empowered. Other factors affecting women's empowerment are marital status, the difference in the education level between a man and a woman, type of family, ownership of an ox, non-farm income, group membership, and access to credit. Marriage reduces the level of women's empowerment by about 0.06%. Married women may have more household responsibilities, such as cooking and caring for their spouse and children, limiting them from participating in activities that would improve their empowerment. Meinzen-Dick *et al*. (2019) found that unmarried women were considered "liberated" in Burkina Faso, and therefore more empowered. However, Chakraborty (2017) claims that family is key to improving women's empowerment in society, since it provides them with emotional and economic support.

An increase in the education level gap between women and men by one year increases women's empowerment by 0.008%. This finding underscores the importance of education among rural women in the developing world. Educated women are more likely to be aware of new agricultural technologies, which could increase their incomes. Educated women may have more employment opportunities, hence higher income and improved farm decision-making (Sharuanga *et al*. 2019). Sell and Minot (2018) indicate that improving the education level by one member disadvantages the other member. Similarly, Meier zu Selhausen (2016) notes that an increase in the education gap reduces the ability of a woman to make decisions in the household due to a feeling of inferiority.

Women's membership in a group significantly increases their empowerment in agriculture, by about 0.17%. Groups are platforms for sharing information on available economic opportunities that would

improve their economic power. Women use group meetings as avenues to deal with household social problems. In addition, women group members sometimes have to deal with abusive spouses, and sharing their experiences with other members helps the latter deal with similar issues, hence giving them power (Brody *et al*. 2015; Sharuanga *et al*. 2019). During group meetings, women usually undergo training in different aspects, such as agriculture and financial management, which improves their decision-making ability in the household (Clement *et al*. 2019).

An increase in off-farm income increases women's empowerment by approximately 0.007%. Income obtained by women from off-farm sources helps them have control over income in the household, hence improving their empowerment. Similarly, off-farm income can be invested in purchasing farm inputs and machinery, which would increase their household income and improve bargaining power (Sharuanga *et al*. 2019).

Ownership of an ox increases women's empowerment by approximately 0.067%. This implies that ownership of non-land productive resources facilitates women's utilisation of land resources to improve their empowerment. In rural areas, an ox is used as a source of traction for tilling land and performing other farm-related activities; thus, it improves women's access to farm labour, which is key to their empowerment (Gebre *et al*. 2021). Ownership of an ox is also a sign of wealth in most traditional societies and thus can facilitate women's access to credit facilities, thereby improving their economic power (Sharaunga *et al*. 2019). An ox can also be hired out to provide income to the household (Holden & Tilahun 2021).

Access by women to credit facilities improves their empowerment by about 0.044%. Income obtained from credit sources can be used to invest in agricultural and non-agricultural income-generating activities and the purchase of assets that could improve women's asset ownership and economic power. Mulema (2018) argues that, when obtaining credit, women are trained on how to use it to improve their lives prudently, thereby improving their access to information for better decision-making in their households. Zaei *et al.* (2018) found that women with access to credit could control their savings and improve their decision-making abilities in their families and society. In addition, they improved their self-confidence and self-esteem.

Polygamy improves women's empowerment by approximately 0.051%. Women who were married to polygamous husbands are more aggressive and are able to spot economic opportunities due to the perceived stiff competition for resources in the household. Similarly, women married to polygamous men, especially the first wives in traditional societies, are neglected, and preference is given to the last wife. Therefore, the first wives are able to join self-help groups to improve their economic status and that of their children (Tsige 2019). Maunde *et al*. (2019) argue that most women in polygamous marriages are not closely monitored by their patriarchal husbands, and therefore they make most decisions about their lives on their own, hence giving them decision-making power.

4. Conclusion and recommendations

The paper reports on an empirical study to determine the effect of possession of land rights on women's empowerment in Kenya as a contribution to the achievement of SDG number 5 on gender equality. In addition to the findings of this study, the paper contributes to the body of knowledge on the measurement of women's empowerment and land tenure security variables. Specifically, women's empowerment was measured using the five domains of the women's empowerment assessment, while the land tenure security variable was measured using the different rights the women possess. Due to the endogeneity problem, a two-stage least squares econometric model was used to analyse the effect of possession of land rights on women's empowerment. The descriptive statistics

show that the majority of women in the study area did not possess land rights. At the same time, those who possessed land rights were significantly more empowered than those who did not. In addition, women with land rights were significantly younger, more educated, and had more land and more off-farm income than those who did not possess land rights.

The result of the two-stage least-squares method show that women's empowerment increases by about 0.25% if women are given the right to use and transfer land. The results emphasise the importance of ensuring access to secure land rights among rural women. Government and other stakeholders could develop and implement policies that facilitate women's access to land rights and improve their economic, social and political power. Other factors affecting women's empowerment were marital status, education level gap, ownership of oxen, being in a polygamous marriage, off-farm income, group membership, and credit access. The government could promote access to both formal and informal education among women to improve their decision-making abilities in the household. Efforts geared towards the promotion of women's access to informal and formal credit should be enhanced. In addition, women should be encouraged to own productive assets, such as oxen, which would improve their bargaining and economic power.

5. Limitation of the study and areas for further research

This study only focused on measuring women's empowerment using the 5DEs of women's empowerment, hence only collected data from households with female adults. Further studies should consider measuring women's empowerment using the 5DEs and gender parity to explain how women are disempowered compared to men, and vice versa. The study is also limited in its measurement of the land tenure variable and its decomposition into a binary variable. Other authors could consider using a categorical variable or an alternative variable to measure the land tenure variable.

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