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Smallholder farming commercialization and food security in Malawi: do land rights and intrahousehold bargaining power matter?

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Abstract

Background The role of agricultural commercialization in improving household food security has been widely documented. Convinced of its importance, in 2020, the Government of Malawi adopted agricultural productivity and commercialization as one of its three key pillars in the pursuit of Agenda 2063. Nonetheless, the importance of institutions in this nexus remains understudied. In this paper, we investigate the role of the interaction of engendered land rights regimes and intrahousehold bargaining power in dictating the agricultural commercialization–food security nexus in a male-dominated society of Malawi. First, we examine the effect of engendered land rights regimes and spouse bargaining power on commercialization of smallholder farming. Then, we analyze the effect of commercialization on food security factoring in the role of land rights regimes and intrahousehold power. We use round 5 of the Malawi Integrated Household Survey (IHS5) fielded in 2019/2020, employing various econometric models such as the fractional logit and Tobit. We control for endogeneity by employing a control function technique.

Results The study results show that households under a matrilineal land holding regime are less likely to commercialize and that an increase in spouse bargaining power increases the likelihood of commercialization. We also find spouse bargaining power to be instrumental in improving food security, especially for households under a matrilineal land holding regime. Interestingly, we find that an increase in commercialization is likely to improve food security for households under a matrilineal land holding regime if there is more spousal bargaining power.

Conclusions Effective policy formulation and implementation around issues of agricultural commercialization and food security requires a fair understanding of the dynamics at play both within households and across different traditions. The results indicate that collaborative decision-making between the household head and spouse holds significant importance in the maximization of food-security-returns from commercialization. This is especially true for matrilineal societies.

Keywords Agricultural commercialization, Food security, Land rights, Intrahousehold bargaining power, Malawi

Introduction

Smallholder farmer commercialization plays a pivotal role in transformation of the agricultural sector and improvement of economic growth and development of developing countries that heavily rely on agriculture [71]. In Malawi, commercialization of smallholder farming has formed the bedrock of agricultural policy as revealed in strategic policy documents such as the National Agriculture Policy (NAP), the National Export Strategy (NES)

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and, recently, the Malawi 2063 (MW2063), among others [29, 30, 48]. On a microlevel, particularly for sub-Saharan Africa, agricultural commercialization has been associated with reductions in household income poverty and food insecurity as well as improvements in nutritional outcomes [50, 51, 53]. Nevertheless, smallholder agriculture in Malawi remains predominantly subsistence-based as evidenced by a low crop commercialization index of 17.6% [12]. This high inclination for subsistence farming is fueled not only by the lack of production surpluses attributed to low levels of productivity among smallholder farmers, but also by missing markets in rural areas [30]. Productivity is low, especially for smallholder farmers, due to constraints that range from unfavorable weather variations (back-to-back cyclones, floods and dry spells) to limited adoption of improved agricultural technologies and practices [72]. This is also reflected in the food system arena where households face food shortages attributed to low own-food production and low exchange entitlement stemming from the loss of potential farm income that would have been realized through commercialization [63].

Globally, food insecurity has been worsening with up to 828 million people affected by hunger in 2021; 2.3 billion people in the world moderately or severely food insecure; and 11.7 percent of the global population faced by severe food insecurity in the same year [27]. This is in spite of the fact that only a few years remain to end hunger, food insecurity and all forms of malnutrition by 2030, as targeted by the Sustainable Development Goals (SDGs).

There is generally no consensus in the literature regarding the nexus between commercialization and food security. For instance, while Radchenko and Corral [63] argue that commercialization leads to food and nutritional security by increasing households' food expenditures, some studies (such as Carletto et al. [12], Dzanku et al. [21], Pingali [59], Pingali and Rosegrant [60]) have shown that commercialization has no significant effect or is detrimental to food and nutritional security as food crops are replaced with cash crops.

One key factor of production that ensures the realization of smallholder commercialization as well as the availability of food is access to farmable land [9, 40]. Several studies (see Martey et al. [42], Nepal and Thapa [49], Rabbi et al. [62] and Berhanu G. and Moti J. [7]) have shown that larger farmland allows for the expansion of crop production and diversification, thereby enabling smallholder farmers to produce sufficiently for both consumption and the market. In Malawi, particularly in rural areas, land tenure is customarily governed by social norms and customs. For instance, the central and southern regions of Malawi predominantly practice matrilineal succession and inheritance whereby land rights are bestowed on women [36, 47]. In contrast, men typically own land rights in the northern region (Ibid). [47] In the literature, Kishindo [35, 36] and Mwale and Kamninga [47] have shown that matrilocal households are more disadvantaged than their counterparts in terms of welfare outcomes and long-term investments. This can be explained by antagonisms between the predominant patriarchal culture that fosters the monopolization of decision-making by men and the land rights that are held by women.

This paper, firstly, builds on and deviates from these studies by examining the role of these engendered land rights in consideration of the cooperation that exists between the household head and spouse (see Zingwe et al. [75]). Secondly, unlike similar studies that have used location (the community in which these households are located) as a proxy for these engendered land rights regimes, we create a composite variable that comprises the marriage system (matrilineal or patrilineal marriage system) and a dummy variable that indicates whether the household possesses land. This variable is more informative and captures engendered land rights more accurately than proxies based on cultural settings of the unit of measure (household). For example, in a state where a household does not own land (rents land) or resides in a community that is different from its culture the proxy variables are highly misrepresentative. This paper therefore builds on and contributes to the current literature by capturing the engendered land rights variable at the household level and examining the role of spouse bargaining power in households under different marriage systems. As a preview, firstly, we find that households holding matrilineal land are less commercialized than those that hold land under patrilineal system. Secondly, an increase in spouse's bargaining power is likely to increase commercialization. Further, an increase in spouse bargaining power is likely to reduce food insecurity for households under matrilineal landholding regime. Similarly, we find that commercialization improves food security in households under matrilineal landholding, especially those that have more bargaining power. The subsequent sections further explore the Malawi context, review the relevant literature, describe the methods employed, and discuss the results.

Land rights in Malawi

Matrilineal vs. patrilineal systems

Most societies acknowledge that land is a resource that is primarily distributed for food production and shelter construction [35]. Different communities have different systems and rules that regulate how land is distributed and controlled. In Malawian communities, access to and control over land are determined based on whether the

community follows the matrilineal or patrilineal system (von Benda-Beckmann, [5]). In matrilocal institutions, females are 'owners' and 'builders of the village', have primary rights over land, and the land is passed on from mother to daughter [35, 36]. In such settings, males enjoy only secondary rights to the land; for example, cultivating on the land. Males mainly obtain these rights as a result of marriage (Fadson v Jafone, Civil Appeal 43 of [24]). Of course, these rights over the land are lost upon the death of their spouse, or divorce. Males also have rights where there are no female heirs in the family or where the family has too much land to cultivate, hence requiring more management. On the contrary, land ownership in the patrilineal system is such that males have primary rights to the land, and these rights are passed on to their sons. In this case, women have secondary rights, which can be derived through marriage or when the males in their family permit them to use the land. In this system, the oldest male will make decisions concerning the land. Notably, it has been argued that these matrilineal and patrilineal systems tend to encourage land tenure insecurity for individuals who settle outside their communities [6]. This is the case as both kinds of societies emphasize that the natives or individual families belonging to and residing in the community have greater claim over the land as compared to foreigners. Hence, those who relocate to other areas have a lesser claim and lower chances of owning land. Of course, it is also worth highlighting that in each of these systems, intrahousehold power dynamics between the 'landowner' and the spouse dictate how the land is used in each growing season. This platform of land rights, alongside power dynamics, may influence the scale of production for households and whether, eventually, a household actually ends up being food secure.

The literature

Theoretical underpinnings

Development of (complementary) theories or perspectives to explain smallholder farmer commercialization was an active area of research especially in the 1990s and early 2000s. These include the: (1) profit maximization, (2) marketable surplus, (3) livelihood strategy, and (4) transactional cost perspectives [39, 58, 60, 69]. Pingali and Rosegrant [60] suggest that agricultural commercialization should entail a household integrating in the market with an objective to maximize profit. On the contrary, the livelihood strategy perspective assumes that farmers' market (dis)engagement is motivated by risk minimization goals [39]. It is argued that if markets—particularly food markets—are unreliable, inefficient or highly volatile, farm households will prioritize feeding themselves (subsistence farming, hence, they will only cultivate very small quantities of crops intended for sale [25, 32, 39]). The transaction cost perspective suggests that smallholder farmers only engage in the market if the barriers to entry are low [58]. Finally, the marketable surplus perspective stipulates that farmers' engagement in the market is based on the production surplus that the household realizes (Berhanu G. and Moti J., 2010; [69]). This means that highly endowed households are more likely to participate in the output market as they achieve a favorably high level of production. In trying to strike a balance, years later, recent literature typically recognizes merits in each of these perspectives. As an example, Pingali et al. [57] observe that commercialization in India is not just a matter of profit maximization or marketable surplus, but small firms also face risks and costs in production and marketing, recognizing the need for innovations such as e-markets. Based on the research questions that this paper seeks to address, we look at commercialization using similar lens.

Bearing witness to the enormous importance of the concept of food security is how copious the literature is—both theoretically and empirically. On the theoretical front, various approaches have been adopted throughout history to explain food security, and these can be broadly classified into five categories: (1) food availability, (2) the income-based approach, (3) the basic needs approach, (4) the entitlement approach, and (5) the sustainable livelihoods approach [11]. As the oldest perspective, the food availability approach—formally known as the Malthusian approach—is mainly credited to Thomas Malthus [41]. The approach perceives the issue of food insecurity as a food availability problem in light of a growing population, such that attainment of food security boils down to improving agricultural supply while stopping population growth. This perspective was revered until the early 1970s when economists recognized that welfare is determined by intersectoral dynamics and not just by the food sector, as the food availability approach had obsessed. This led to the emergence of the income-based approach, which proposed a shift in paradigm from looking at food availability from a purely macrolevel perspective to considering income at the microlevel [11, 31]. According to this approach, food insecurity is perceived as food poverty where one lacks income for use in the purchase of food (FAO, [26]). In light of the limitations associated with looking at food security mainly as an income problem—including the fact that income can be inaccurately measured in subsistence economies—the international labor organization (ILO) introduced the basic needs approach to capture nonpecuniary aspects of food and development, thereby looking at the food itself and not income, whose demand is derived only when factored into the food insecurity problem [11].

Despite the developments in the 1970s, food security policy was still predominantly shaped by key tenets of the food availability approach until the early 1980s, when Sen's [66] entitlement approach gained ground, highlighting the importance of people's access to food and not food availability at the national level [11]. According to Sen [66], a person's entitlement to food is a function of their endowments/resources owned and the commodities the person can access through production and trade. Consequently, a number of stakeholders, including international organizations, applied this perspective to food security culminating in the widely accepted definition of food security as "access by all people at all times to enough food for an active, healthy life" [73]. Beyond these approaches, Chambers (13, 14) introduced a more comprehensive approach to sustainable livelihoods which, to date, has been championed by UN agencies, among others. This approach emphasizes the need for natural capital, physical capital, human capital, financial capital and social capital, in line with Sen's [66] endowments, and focuses on gaining a living, similar to the basic needs approach [11]. Similarly, in this study, we look at food security using the same lenses, as the approach ties the food problem to the distribution of the various kinds of capital.

Empirical literature

Empirically, a plethora of studies have examined food security in terms of its various determinants. Among others, recent studies have generally shown that food security is influenced by climatic factors (including rainfall variability [34, 44, 45]; household practices (such as tolerance to postharvest losses [38] and access to credit [10, 65]); and the adoption of various technologies (including agricultural mechanization [23] and genetic engineering [2]). Commercialization has been found to have heterogeneous effects on food security in different contexts [1, 37, 52]. Significant improvements in food security can also be achieved if bias against women is reduced [61]. In addition, some studies go beyond the microlevel, finding that the food situation tends to be better in democratic countries [17, 74], better when women's rights are improved [8] and better when agricultural foreign direct investment (FDI) is lower [20].

Methodology

Data

This paper employed secondary survey data from the Integrated Household Survey round 5 (IHS5) fielded from April 2019 to March 2020. The survey sampled 11,434 households that were statistically selected to be representative at the national, district, urban and rural levels and was designed to provide information on the various aspects of household welfare in Malawi. The IHS5 used a stratified sampling design, where 719 census enumeration areas (EAs) were selected as primary sampling units (PSUs) with an average of approximately 16 households each. For the sampled communities and households, four types of questionnaires were administered during the survey—the Household, Agricultural, Fisheries and Community Questionnaires. The main variables of interest in this study, the gender variables and the outcome variables, are sourced from the agriculture and household questionnaires. Both questionnaires were administered concurrently to the sampled household. In this paper, we obtain a usable sample of 4,337 farming households whose head is married and who owns land. Worth highlighting, one possible way to deal with endogeneity issues would be to adopt panel methods on the IHS panel. However, our variables of interest are not included in that data, forcing us to attempt to deal with endogeneity in a cross-sectional data setting.

Conceptual framework

Agricultural models have highlighted the non-separability of production and consumption decisions of agrarian households (Singh et al., [67]). The household decision-making process regarding the allocation of resources toward investments or consumption can be attributed to the power dynamics that govern the household. Inspired by Becker [3], a strand of literature has adopted the unitary approach in analyzing the decision mechanism of households where decisions are supposedly made by the household head. However, in this paper, we assume that engendered cooperation and antagonisms exist in decision-making between the head and the spouse since, for one, in a matrilineal setting women possess land rights regardless of whether households are headed by men. We therefore adapt the framework proposed by Zingwe et al. (2023) as follows:

$$P_h = f[e(c), v(b)], \tag{1}$$

where P_h represents household h's power dynamics, which is a function of the executive (inherent) power of the household head, which is in turn a function of household head characteristics c, and voice, which is also a function of spouse bargaining power b. In formulating spouse bargaining power, we follow Gibson et al. [28], who used principal component analysis (PCA) to construct the bargaining power variable from differences in age, education and income between the head and the spouse. In a unitary household, $v(b) = 0$ or $v(b) < 0$ and $e(c)$ are constant; while in a household that allows cooperation between the spouse and the household head, $e(h)$ is constant and $v(b) > 0$.

Analytical framework

As stated earlier, the paper is two-pronged, so we adopt two econometric approaches to test our hypotheses. First, we examine the effect of engendered land rights on smallholder commercialization in the context of bargaining power by using the fractional logit model. According to Papke and Wooldridge [55], the fractional logit model is efficient and robust and fits well with a dependent variable that has fractional responses. In our case, the dependent variable, household commercialization index (HCI), measures the fraction of agricultural produce that is sold and has values ranging from 0 to 1. To achieve the objective, we estimate the following equation:

$$HCI_i = \alpha + \beta b_i + \delta m_i + \lambda(b_i \times m_i) + \sum_i \gamma_i X_i + \varepsilon_i, \quad (2)$$

where the right-hand side of Eq. 2 consists of exogenous variables and their corresponding coefficients. In the model, b_i represents spouse bargaining power; m_i represents engendered land rights (here, indicator for matrilineal or patrilineal system); X_i represents various controls (including demographic, socioeconomic and community variables as well as month fixed effects to control for seasonality); and ε_i is the error term. From the equation, the coefficients of interest are δ—which captures the effect of land rights on commercialization—and λ—which looks at the effect of land rights in the presence of spouse bargaining power. The details of the exogenous variables are presented in Table 1.

We then analyze the nexus between commercialization and food security in the context of engendered land rights and spouse bargaining power. To achieve this goal, we captured food security using two indicators: (i) the coping strategy index (CSI), and (ii) the food consumption score (FCS). We estimate the following equation for food security:

$$FS_i = \alpha + \beta b_i + \delta m_i + \lambda(b_i \times m_i) + \pi HCI_i + \sigma(b_i \times m_i \times HCI_i) + \sum_i \gamma_i X_i + \varepsilon_i, \quad (3)$$

where *FS* is measured by *CSI* or *FCS*. In this case, CSI captures the number of coping strategies that households employ when facing food shortages, including households' reliance on less preferred or less expensive foods; limiting portion size of food at meal times; reducing number of meals eaten in a day; restricting consumption by adults in order for children to eat; and borrowing or relying on food help from a friend or relative [43].

Table 1 Definition of exogenous variables used in the model

Variable	Definition
Head is male	A dummy variable (1/0) representing male-headed household
Matrilineal landholding	A dummy variable (1/0) representing land owned by a household under a matrilineal system of marriage
Spouse bargaining power	A composite variable comprising education, age and income differences between the household head and spouse formulated using principal component analysis (PCA)
Nonfarm income	Nonfarm income in Malawi Kwacha (MK)
Household size	Number of members in a household
Years of education for the head	Number of years that the household head stayed in school
Age of head	Age of a household head in years
Family labor	A dummy variable (1/0) indicating if the household used family labor in agricultural production
Wealth	Asset index created using PCA
Hired labor	A dummy variable (1/0) indicating if the household used hired labor in agricultural production
FISP	A dummy variable (1/0) indicating if the household received government subsidized fertilizer
Unsubsidized fertilizer	Quantity of unsubsidized fertilizer in kilograms
Agricultural extension	A dummy variable (1/0) indicating if the household received extension services
Credit	A dummy variable (1/0) indicating if the household accessed credit
North	A regional dummy (1/0) indicating if the household is in the northern region
Central	A regional dummy (1/0) indicating if the household is in the central region
South	A regional dummy (1/0) indicating if the household is in the southern region
Wage employment	A dummy variable (1/0) indicating if the household head's main employment involves wages
Farming	A dummy variable (1/0) indicating if the household head is a farmer
Nonfarm business	A dummy variable (1/0) indicating if the household head's main occupation is nonfarm business
Day market	A dummy variable (1/0) indicating if the household has access to a day market in the community
Urban	A dummy variable (1/0) indicating if the household resides in an urban area, compared to a rural area

The severity of food insecurity is positively determined by the number of strategies that households employ. CSI is therefore a double-bound variable that ranges from 0 to 56; and, as such, we employ a Tobit model to estimate Eq. 3 when $FS = CSI$. The Tobit model works with a mixture of discrete and conditional distributions for variables that have a lower or upper limit. FCS measures the quantity and quality of food that households consume, and it is a composite score based on dietary diversity, food frequency and relative nutritional importance of different food groups consumed during 7 days (WFP, [70]). For that, we employ the ordinary least squares (OLS) estimation technique on Eq. 3, and to ensure robustness of the models, a series of tests and remedies for potential estimation problems are adopted.

In estimation, we suspect endogeneity to arise between the food security indicators (CSI and FCS) and the commercialization indicator (HCI) as unobservable characteristics may influence commercialization and food security. Also, there could be reverse causality between the variables. As such, we include as many control variables as possible and use the control function (two-step) technique; where HCI is the dependent variable in the first stage, and a valid instrumental variable and various controls are regressors. From the first stage, we obtain residuals that are included in the second stage (in our case) which employs the Tobit and OLS models for CSI and FCS, respectively. We identify access to extension services as a valid instrumental variable (IV) in our study; given that we expect it to influence household commercialization (relevance condition) and we hypothesize that commercialization will affect food security mainly through access to the extension services. To confirm instrument validity, we conduct a falsification test, results of which are presented in Table 2—indicating that, indeed, access to extension services is a valid IV in both food security models (for CSI and FCS). The first-stage econometric model is presented in Eq. 4, with the valid IV as a regressor:

$$HCI_i = \alpha + \beta b_i + \sum_i \gamma_i X_i + \delta m_i + \lambda(m_i \times b_1) + \tau IV_i + \varepsilon_i. \quad (4)$$

Table 2 Pairwise correlation for testing validity of the instrument

	Outcome variables		The endogenous regressor
Instrumental variable	CSI	FCS	HCI
Agricultural extension	0.117	0.056	0.000

P-values reported

Discussion of the results

Descriptive statistics

Table 3 presents descriptive statistics of the variables used in the analysis. We draw comparisons between households under the patrilineal and matrilineal land holding regimes. First, the food security indicators show that food insecurity is visible but not severe. In particular, the average CSI and FCS are 6.3 and 49.8, respectively. There is a significant difference of 1.8 in the CSI between households under patrilineal and matrilineal landholding regimes, showing that households with matrilineal land holding are more food insecure than their counterparts. The HCI shows that households practice subsistence farming, with only 20 percent of the total production being sold. Patrilineal households commercialize more than matrilineal households, with a 6 percent significant difference. The results show that there is more spousal bargaining power for households under a matrilineal system than under a patrilineal system, highlighting the fact that most households are male-dominated despite the marriage regime. Of course, theoretically, more spouse bargaining power signals that there is high cooperation in decision-making, whereas less spouse bargaining power implies that the decision is unilaterally made by the household head. Within our setting, where most of the respondents report that the head is male (97 percent overall), these statistics show that female spouses generally bargain more within the matrilineal system, as would be expected.

The results further show that household headship is more by males, especially in the patrilineal land holding regime, as evidenced by a statistically significant 2 percent difference. In addition, about 17, 86 and 25 percent of households, respectively, have wage employment, farming, and nonfarming business as their main occupations. From these, more household heads under patrilineal landholding are involved in farming (88 percent) than matrilineal households are (84 percent). On the other hand, more household heads under the matrilineal landholding system have nonfarming business as their main source of livelihood compared to patrilineal households. This is evidenced by 4 and 6 percent differences for farming and nonfarming businesses, respectively, and signals that household heads in patrilineal land systems predominantly use their farming as a source of livelihood, while those in matrilineal land systems invest more in nonfarming sources of livelihoods. Nonetheless, more patrilineal households access agricultural extension than matrilineal households do, and up to 27 percent of households use hired labor; with significant differences indicating that more matrilineal households than patrilineal households use hired labor. The results show no significant differences

Table 3 Descriptive statistics of the variables used

Variable	Pooled sample	Patrilineal land holding	Matrilineal land holding	Difference
CSI	6.324	5.604	7.375	−1.770***
FCS	49.819	50.184	49.819	0.900
HCI	0.207	0.233	0.169	0.064***
Primary livelihood source				
Wage employment	0.169	0.161	0.181	−0.020
Farming	0.861	0.879	0.835	0.044***
Nonfarm business	0.253	0.227	0.291	−0.064***
Head is male	0.965	0.973	0.954	0.020**
Spouse bargaining power	0.003	−0.021	0.038	−0.059*
Nonfarm income (MWK)	212,402.00	235,893.40	178,049.60	57,843.78**
Household size	5.109	5.118	5.096	0.023
Years of education	7.792	7.995	7.495	0.500***
Age of head (years)	41.057	41.175	40.885	0.290
Family labor	0.989	0.991	0.986	0.005
Hired labor	0.274	0.259	0.296	−0.037**
Wealth	0.016	0.013	0.021	−0.008**
FISP	0.109	0.097	0.126	−0.029***
Non-FISP fertilizer	436	663.083	103.915	559.168
Agricultural extension	0.591	0.635	0.526	0.110***
Credit access	0.343	0.335	0.358	−0.023
Daily market	0.294	0.276	0.307	0.030**
Urban residence	0.109	0.099	0.125	−0.027***
Region of residence				
Northern region	0.237	0.385	0.020	0.364***
Central region	0.352	0.355	0.349	0.006
South region	0.411	0.261	0.631	−0.370***
N	4337	2542	1795	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

in the average number of people in a household, age of the household head, usage of family labor, purchase of nonsubsidized fertilizer, or access to credit between the two regimes. The average nonfarm household income is 212,402.00 Malawi Kwacha (MWK), and households under the patrilineal system have approximately 57,843 MWK more income than those under the matrilineal system. Interestingly, despite registering lower nonfarm incomes, matrilineal households are wealthier and more matrilineal households receive FISP fertilizer than patrilineal households. This could be reflecting the typical expenditure patterns between males and females where males have been found to invest more in non-asset expenditure goods. For the regional dummies, as expected, more matrilineal households are in the southern region, and more patrilineal households are in the north, with no significant differences between the patrilineal and matrilineal households located in the central region.

Econometric results

Table 4 presents results of the econometric analyses performed on Eqs. 2, 3 and 4. First, in the model for commercialization (Column 1), the independent variables of interest include all the gender variables; in particular, engendered headship, matrilineal landholding regime, and bargaining power. The results show that male-headed households are more likely to commercialize than female-headed households, other things held constant. Also, households in a matrilineal landholding regime are less likely to commercialize than are those in a patrilineal regime. These results echo the findings of Kishindo (35, 36) and Mwale and Kamninga [47], who highlighted that, in Malawi, households are predominantly male-headed and so there is reluctance to invest in land owned by women in fear of losing investment if the marriage breaks up. Notably, female farm managers in Malawi mainly grow crops that are used for their own consumption, while male farm managers grow crops that can be sold

Table 4 Land rights, commercialization and food security

		CF Stage 1:	CF Stage 2:	
	HCI	HCI	CSI	FCS
	(1)	(2)	(3)	(4)
Head is male	0.488***	0.452**	−1.456	3.329**
	(0.179)	(0.178)	(0.917)	(1.332)
Matrilineal	−0.123**	−0.123**	2.225***	−1.049*
	(0.060)	(0.060)	(0.416)	(0.615)
Bargaining power	0.161***	0.145***	−0.891***	2.334***
	(0.044)	(0.037)	(0.311)	(0.439)
Matrilineal × bargaining power	−0.047		−0.870**	−0.766
	(0.055)		(0.382)	(0.604)
Day market	−0.163***	−0.131**	−0.832**	1.845***
	(0.061)	(0.062)	(0.380)	(0.552)
Household size	0.008	−0.002	0.564***	0.147
	(0.017)	(0.017)	(0.104)	(0.155)
Years of education	0.029***	0.019**	−0.521***	1.267***
	(0.009)	(0.010)	(0.060)	(0.089)
Age of head	0.023*	0.019	−0.147*	0.271**
	(0.013)	(0.013)	(0.076)	(0.111)
Age of head—squared	−0.000*	−0.000*	0.001	−0.001
	(0.000)	(0.000)	(0.001)	(0.001)
Wealth	−0.653**	−1.433***	−7.052***	12.123***
	(0.311)	(0.410)	(1.843)	(2.609)
FISP	0.100	0.059		
	(0.082)	(0.084)		
Agricultural extension	0.223***	0.179***		
	(0.056)	(0.057)		
Credit	0.051	0.037	1.359***	0.481
	(0.057)	(0.057)	(0.341)	(0.486)
Central	0.527***	0.531***		
	(0.076)	(0.076)		
South	−0.873***	−0.818***		
	(0.085)	(0.087)		
Nonfarm income			−0.000***	0.000***
			(0.000)	(0.000)
HCI			−2.620***	3.835***
			(0.747)	(1.139)
HCI × bargaining power			1.013	−1.392
			(0.753)	(1.139)
HCI × matrilineal			0.247	−1.295
			(1.263)	(1.814)
HCI × bargaining power × matrilineal			0.236	4.677**
			(1.329)	(2.027)
Wage employment			−2.849***	5.533***
			(0.498)	(0.787)
Farming			−0.899*	1.983***
			(0.505)	(0.756)
Nonfarm business			−2.569***	4.339***
			(0.409)	(0.599)
Urban			−1.010	6.867***

Table 4 (continued)

		CF Stage 1:	CF Stage 2:	
	HCI	HCI	CSI	FCS
	(1)	(2)	(3)	(4)
			(0.627)	(0.961)
			(0.748)	(1.149)
Residual			−5.639***	−13.275***
			(1.965)	(3.423)
_cons	−2.609***	−2.407***	17.795***	19.513***
	(0.338)	(0.338)	(1.960)	(2.898)
Month FEs	NO	NO	YES	YES
var(e.csir)			100.991***	
			(2.756)	
F/Chi2	660.24***	662.14***	640.72***	34.437***
P	0.000	0.000	0.000	0.000
N	4,337	4,337	4,336	4,337

Robust standard errors are in parentheses. Column 1 estimates Eq. 2 using the fractional logit; columns 3 and 4 estimate Eq. 3 using the Tobit and OLS regression models, respectively; and Column 2 estimates Eq. 4, which is the first stage of the control function (CF). Food security regressions (Columns 3 and 4) include monthly fixed effects, which are not necessary for commercialization equations (Columns 1 and 2)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

[46]. Our results also show that an increase in spouse bargaining power increases the likelihood of commercializing, signaling that cooperation between the household head and spouse fosters agricultural commercialization. For the interaction term, we do not find any significant effect of changes in bargaining power under the matrilineal system.

Of the other variables, the coefficients for education of the head and residence in the central region are statistically significantly positive; indicating that, as expected, an increase in the head's education increases the likelihood of commercialization, and households that reside in the central region are more likely to commercialize. On the contrary, residence in the southern region and wealth are negatively associated with commercialization. This result on wealth could signal the likelihood that wealthier households will move away from agricultural enterprises to more prestigious enterprises. Having a day market is interestingly associated with less commercialization.

Column (2) shows results of the first stage of the control function (CF) that we adopted to obtain residuals that are used to control for endogeneity in the second-stage models for CSI (Column 3) and FCS (Column 4). In Column (2), the coefficient on our instrumental variable (access to agricultural extension services) is statistically significant, in line with our relevance condition. Columns (3) and (4) show that an increase in commercialization (HCI) negatively affects the coping strategy index (CSI) and positively affects the food consumption score (FCS); indicating that, overall, agricultural commercialization improves household food security. This finding is contrary to that of Dzanku et al. [21], who found no significant relationship between commercialization and food security in Ghana. Similarly, in Malawi, Carletto et al. [12] reported no significant effect of crop commercialization on nutrition. A likely reason for the disparities between our findings and those of these previous studies is differences in variable definitions—where we utilize food security indicators that encompass a higher measure of food availability in terms of quantity (which might be sensitive to commercialization), as opposed to focusing on food quality. The results in Table 4 also indicate, for the other variables of interest, a negative relationship between CSI and the interaction between the matrilineal land rights regime and bargaining power at the 5 percent level of significance; a positive relationship between bargaining power and FCS at all levels of significance; and a positive relationship between FCS and the interaction effect of bargaining power, matrilineal and HCI at the 5 percent level. These results demonstrate that intrahousehold bargaining power plays a crucial role in enhancing commercialization and improving food security. It has been alluded to by Beegle et al. [4] that spouse bargaining power can alter couples' behavior within the household. In addition, it ensures that there is cooperation in decision-making within the household, regardless of the property rights and other social norms or customs that dictate the power dynamics in the household. For instance, based on our findings, the effect of matrilineal landholding on food security is nonsignificant (especially

in terms of FCS), but food security for households under matrilineal landholding systems improves when spouses' bargaining power increases (especially in terms of CSI). In fact, the results show that households under matrilineal systems benefit more from commercialization when there is bargaining power. In terms of land rights, Djurfeldt et al. [18] found that women's land rights are not enough to affect decisions in households, as decisions are unilaterally made by men, despite the whole family's participation in farming. In this paper, we have broadened this narrative by providing evidence that spouse bargaining power plays a significant role in ensuring that women's land rights effect changes. Given the evident gender disparity in access to resources such as agricultural extension and technologies, predominantly in favor of men [64], it is reasonable to expect intrahousehold cooperation to yield favorable welfare outcomes in matrilineal systems.

With respect to the controls, years of education of the household head, household wealth, wage employment, nonfarm business, and access to a day market all significantly improve household food security, as captured by both the CSI and FCS. The relationship between day market and FCS is positively significant, yet positive effects are not through commercialization. An increase in household size is likely to increase the likelihood of food insecurity, as evidenced by the CSI.

Conclusion and policy implications

Global food insecurity has been worsening in spite of efforts made to end hunger and food insecurity. One key factor that countries, including Malawi, are palpably adopting in their policies to end hunger in line with national and UN Global goals is the commercialization of smallholder agriculture. However, agricultural commercialization is a function of availability of and access to land which is predominantly defined by prevailing land rights and household dynamics in the context of strong cultural traditions. In this study, we analyzed the effect of engendered land rights regimes and intrahousehold (spouse) bargaining power on the commercialization of smallholder farms and food security in Malawi. We find that households under a matrilineal land holding regime are less likely to commercialize than those under a patrilineal land holding regime and that an increase in spouse bargaining power increases the likelihood of commercialization. We also find that spouse bargaining power improves food security, especially for households under a matrilineal land holding regime, more than for those under a patrilineal land holding regime. In addition, an increase in commercialization is likely to improve food security for households under a matrilineal land holding regime if there is more spousal bargaining power. Overall, this paper establishes that in a patriarchal sphere such as Malawi, women's land rights are likely to enhance land investments and improve household welfare if they are cemented by intrahousehold cooperation (a function of spouse bargaining power). We are aware that spousal bargaining power is particularly dependent on education and income of the spouse. This implies that deliberate holistic efforts that promote women's education and ensure access to financial resources must be taken in light of inherent land rights.

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Author contributions
LPM conceived the idea; LPM and DEZ analyzed and interpreted the data and drafted and revised the manuscript; and AEK drafted the manuscript.

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Availability of data and materials
The data used in the analyses are publicly available on the World Bank website: https://microdata.worldbank.org/index.php/catalog/3818. Replication files will be made available upon request.

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

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References

1. Abdoellah OS, Schneider M, Nugraha LM, Suparman Y, Voletta CT, Withaningsih S, Parikesit H, AHakimL. Homegarden commercialization: extent, household characteristics, and effect on food security and food sovereignty in Rural Indonesia. Sustain Sci. 2020;15(3):797–815. https://doi.org/10.1007/s11625-020-00788-9.
2. Adeyeye SAO, Idowu-Adebayo F. Genetically modified and biofortified crops and food security in developing countries: a review. Nutr Food Sci. 2019;49(5):978–86. https://doi.org/10.1108/NFS-12-2018-0335.
3. Becker G. A Treatise on the family. Massachusetts: Havard University Press Cambridge; 1991.
4. Beegle K, Frankenberg E, Thomas D. Bargaining power within couples and use of prenatal and delivery care in Indonesia. Stud Family Plan. 2001;32(2):130–46. https://doi.org/10.1111/j.1728-4465.2001.00130.x.
5. von Benda-Beckmann F. Legal pluralism in Malawi: Historical development 1858–1970 and emerging issues. Kachere Monographs No. 24. 2007: 1-199
6. Berge E, Kambewa D, Munthali A, Wiig H. Lineage and land reforms in Malawi: do matrilineal and patrilineal landholding systems represent a problem for land reforms in Malawi? Land Use Policy. 2014;41:61–9. https://doi.org/10.1016/j.landusepol.2014.05.003.
7. Berhanu G. and Moti J. (2010). *Commercialization of smallholders: Is market participation enough? By Gebremedhin, Berhanu and Jaleta, Moti*. P22.

8. Bhandari A, Burroway R. Hungry for equality: a longitudinal analysis of women's legal rights and food security in developing countries. Sociol Quarterly. 2018;59(3):424–48. https://doi.org/10.1080/00380253.2018.1479199.
9. Bhaumik SK, Dimova R, Gang IN. Is women's ownership of land a panacea in developing countries? Evidence from land-owning farm households in Malawi. J Dev Stud. 2016;52(2):242–53. https://doi.org/10.1080/00220388.2015.1060314.
10. Bidisha SH, Khan A, Imran K, Khondker BH, Suhrawardy GM. Role of credit in food security and dietary diversity in Bangladesh. Econ Analysis Policy. 2017;53:33–45. https://doi.org/10.1016/j.eap.2016.10.004.
11. Burchi, F., & De Muro, P. (2012). A human development and capability approach to food security: Conceptual framework and informational basis. In *United Nations Development Programme* (No. 2012–009; Issue February). https://www.undp.org/sites/g/files/zskgke326/files/migration/africa/Capability-Approach-Food-Security.pdf
12. Carletto C, Corral P, Guelfi A. Agricultural commercialization and nutrition revisited: empirical evidence from three African countries. Food Policy. 2017;67:106–18. https://doi.org/10.1016/j.foodpol.2016.09.020.
13. Chambers, R. (1983). Rural development: Putting the last first. London; New York: Longman
14. Chambers R. Poverty and livelihoods: whose reality counts? Environ Urban. 1995;7:173.
17. D'souza F. Democracy as a cure for famine. J Peace Res. 1994;31(4):369–73.
18. Djurfeldt A, Hillbom E, Mulwafu WO, Mvula P, Djurfeldt G. "The family farms together, the decisions, however are made by the man" — Matrilineal land tenure systems, welfare and decision making in rural Malawi. Land Use Policy. 2018;70:601–10. https://doi.org/10.1016/j.landusepol.2017.10.048.
20. Dogan. Does FDI in agriculture promote food security in developing countries? The role of land governance. Transnat Corp. 2022. https://doi.org/10.1835/2076099x-29-2-3.
21. Dzanku FM, Tsikata D, Ankrah DA. The gender and geography of agricultural commercialization: what implications for the food security of Ghana's smallholder farmers? J Peasant Stud. 2021. https://doi.org/10.1080/03066150.2021.1945584.
23. Emami M, Almassi M, Bakhoda H, kalantari I. Agricultural mechanization, a key to food security in developing countries: Strategy formulating for Iran. Agric Food Secur. 2018;7(1):1–12. https://doi.org/10.1186/s40066-018-0176-2.
24. Fadson v Jafone (Civil Appeal 43 of 2013) [2017] MWHC 40 (20 February 2017)
25. Fafchamps M, Gabre-madhin E. Agricultural markets in Benin and Malawi. AfJARE. 2006;1(1):67–94.
26. FAO (Food and Agriculture Organization). (2008). *Deriving Food Security Information from National Household Budget Surveys* (R. Sibrian (ed)). FAO. https://www.undp.org/sites/g/files/zskgke326/files/migration/africa/Capability-Approach-Food-Security.pdf
27. FAO, IFAD, UNICEF, WFP, & WHO. (2022). Repurposing food and agricultural policies to make healthy diets more affordable. In *The State of Food Security and Nutrition in the World 2022*. https://doi.org/10.4060/cc0639enF
28. Gibson J, Le T, Scobie G. Household bargaining over wealth and the adequacy of women's retirement incomes in New Zealand. Fem Econ. 2006;12(1–2):221–46. https://doi.org/10.1080/13545700500508536.
29. GoM. (2012). *Malawi National Export Strategy: 2013 - 2018* (Vol. 1). Ministry of Industry and Trade. https://mitc.mw/trade/images/Malawi National Export Strategy.pdf
30. GoM. (2016). *National Agriculture Policy 2016*. Ministry of Agriculture, Irrigation and Water Development. https://reliefweb.int/sites/reliefweb.int/files/resources/NAP_Final_Signed.pdf
31. Griffen K, Khan AR. Poverty and Landlessness in Rural Asia. Geneva: ILO; 1977.
32. Jayne TS. Do high food marketing costs constrain cash crop production? Evidence from Zimbabwe *. Econ Dev Cult Change. 1994;42(2):387–402.
34. Kinda SR, Badolo F. Does rainfall variability matter for food security in developing countries ? Cogent Econ Finance. 2019. https://doi.org/10.1080/23322039.2019.1640098.
35. Kishindo P. Emerging reality in customary land tenure: the case of Kachenga village in Balaka district, southern Malawi. Afr Sociol Rev. 2011;14(1):102–11. https://doi.org/10.4314/asr.v14i1.70231.
36. Kishindo P. The marital immigrant land, and agriculture A Malawian case study. Afr Sociol Rev. 2011b;14(2):89–97. https://doi.org/10.4314/asr.v14i2.70238.
37. Kissoly L, Fasse A, Ulrike G. Intensity of commercialization and the dimensions of food security: the case of smallholder farmers in rural Tanzania. J Agribus Dev Emerg Econ. 2020;10(5):731–50. https://doi.org/10.1108/JADEE-06-2019-0088.
38. Kumar D, Kalita P. Reducing postharvest losses during storage of grain crops to strengthen food security in developing countries. Foods. 2017;6(1):1–22. https://doi.org/10.3390/foods6010008.
39. Leavy J, Poulton C. Commercialization in agriculture. Ethiopian J Econ. 2007;16(1):3–41.
40. Lerman Z. Policies and institutions for commercialization of subsistence farms in transition countries. J Asian Econ. 2004;15(3):461–79. https://doi.org/10.1016/j.asieco.2004.05.004.
41. Malthus, T. 1798. An essay on the principle of population. London: J Johnson
42. Martey E, Etwire PM, Wiredu AN, Ahiabor BDK. Establishing the link between market orientation and agricultural commercialization: empirical evidence from Northern Ghana. Food Sec. 2017;9(4):849–66. https://doi.org/10.1007/s12571-017-0688-9.
43. Maxwell D, Vaitla B, Coates J. How do indicators of household food insecurity measure up ? An empirical comparison from Ethiopia. Food Policy. 2014;47:107–16. https://doi.org/10.1016/j.foodpol.2014.04.003.
44. McLaughlin SM, Bozzola M, Nugent A. Changing climate, changing food consumption? impact of weather shocks on nutrition in Malawi. J Dev Stud. 2023;59(12):1827–48. https://doi.org/10.1080/00220388.2023.2244634.
45. Murali J, Afifi T. Rainfall variability, food security and human mobility in the Janjgir-Champa district of Chhattisgarh state India. Climate Dev. 2014;6(1):28–37. https://doi.org/10.1080/17565529.2013.867248.
46. Mvula P, Mulwafu W. Intensification, crop diversification, and gender relations in Malawi. Agric Diversif Gender Rural Afr. 2018. https://doi.org/10.1093/oso/9780198799283.003.0007.
47. Mwale, M. L., & Kamninga, T. M. (2022). *Land rights and the impact of farm input subsidies on poverty convergence* (No. 112431; Issue 112431). https://mpra.ub.uni-muenchen.de/112431/
48. National Planning Commission. (2020). *Malawi's Vision: An inclusively Wealthy and Self-reliant Nation*. National Planning Commision. https://malawi.un.org/sites/default/files/2021-01/MW2063- Malawi Vision 2063 Document.pdf%0A%0A
49. Nepal R, Thapa GB. Determinants of agricultural commercialization and mechanization in the hinterland of a city in Nepal. Appl Geogr. 2009;29(3):377–89. https://doi.org/10.1016/j.apgeog.2008.12.002.
50. Ochieng J, Knerr B, Owuor G, Ouma E. Commercialization of food crops and farm productivity: evidence from smallholders in Central Africa. Agrekon. 2016;55(4):458–82. https://doi.org/10.1080/03031853.2016.1243062.
51. Ogutu SO, Gödecke T, Qaim M. Agricultural commercialization and nutrition in smallholder farm households. J Agric Econ. 2020;71(2):534–55. https://doi.org/10.1111/1477-9552.12359.
52. Oluwatayo IB, Rachoene MA. Effect of agricultural commercialization on food security among smallholder farmers in Polokwane Municipality, Capricorn District of Limpopo Province, South Africa. J Agribus Rural Dev. 2017;16(1):143–56. https://doi.org/10.1730/j.jard.2017.00277.
53. Orr A, Tsusaka T, Kee-Tui H, Msere H. What do we mean by "women's crops"? Commercialization, gender and the power to name. J Int Dev. 2016. https://doi.org/10.1002/jid.
55. Papke, L. E., & Wooldridge, J. M. (1996). Variables with an application to 401 (k) plan participation rates. *Journal of Applied Econometrics*, *11*(February), 619–632. http://www.jstor.org/stable/2285155?origin=JSTOR-pdf
57. Pingali P, Aiyar A, Abraham M, Rahman A. Transforming food systems for a rising India. In: Palgrave studies in agricultural economics and food policy. Cham: Springer; 2019.
58. Pingali, P., Khwaja, Y., & Meijer, M. (2005). Commercializing small farms: Reducing transaction costs ESA Working Paper No . 05–08. *05*, 2–42. http://www.fao.org/3/a-af144t.pdf
59. Pingali, P. (1997). From subsistence to commercial production systems: The transformation of Asian agriculture. 79, 628–634.
60. Pingali P, Rosegrant MW. Agricultural commercialisation and diversification: processes and policies. Food Policy. 1995;20(3):171–85.

61. Quisumbing AR, Brown LR, Feldstein HS, Haddad L, Peña C. Women: the key to food security. Food Nutr Bull. 1996;17(1):1–2. https://doi.org/10.1177/156482659601700116.
62. Rabbi F, Ahamad R, Ali S, Chandio AA, Ahmad W, Ilyas A, Din IU. Determinants of commercialization and its impact on the welfare of smallholder rice farmers by using Heckman's two-stage approach. J Saudi Soc Agric Sci. 2019;18(2):224–33. https://doi.org/10.1016/j.jssas.2017.06.001.
63. Radchenko N, Corral P. Agricultural commercialization and food security in rural economies: Malawian experience. J Dev Stud. 2018;54(2):256–70. https://doi.org/10.1080/00220388.2017.1283014.
64. Ragasa C, Berhane G, Tadesse F, Taffesse AS. Gender differences in access to extension services and agricultural productivity. J Agric Educ Ext. 2013;19(5):437–68. https://doi.org/10.1080/1389224X.2013.817343.
65. Salima W, Manja LP, Chiwaula LS, Chirwa GC. The impact of credit access on household food security in Malawi. J Agric Food Res. 2023. https://doi.org/10.1016/j.jafr.2022.100490.
66. Sen A. Ingredients for famine analysis: food availability and entitlements. Quarterly J Econ. 1981;96(3):1981. https://doi.org/10.2307/1882681.
67. Singh I, Squire L, Strauss J. A Survey of agricultural household models: Recent findings and policy implications. World Bank Econ Rev. 1986;1(1):149–79. https://doi.org/10.1093/wber/1.1.149.
69. von Braun J. Agricultural commercialization: impacts on income and nutrition and implications for policy. Food Policy. 1995;20(3):187–202. https://doi.org/10.1016/0306-9192(95)00013-5.
70. WFP, V. A. M. (2008). *Food consumption analysis: Calculation and use of the food consumption score in food security analysis*. *WFP: Rome*
71. Wood, B., Nelson, C., Kilic, T., & Murray, S. (2013). Up in Smoke ? Agricultural Commercialization, Rising. *World Bank Policy Research Working Paper, (6650).* (No. 6650). http://econ.worldbank.org
72. World Bank. (2017). *Malawi - Agricultural Commercialization Project*. World Bank. https://documents1.worldbank.org/curated/en/513181496841168888/pdf/Malawi-PAD-05042017.pdf
73. World Bank (1986), Poverty and hunger: Issues and options for food security in developing countries, World Bank, Washington D.C.
74. Zidouemba PR. Does democracy promote food security in development countries? An Empirical analysis. Int J Food Agric Econ. 2017;5(4):99–120.
75. Zingwe DE, Manja LP, Chirwa EW. The effects of engendered intra-household power dynamics on household food security and nutrition in Malawi. J Gend Stud. 2021;00(00):1–19. https://doi.org/10.1080/09589236.2021.1940110.

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