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Is women's ownership of land a panacea in developing countries? Evidence from land-owning farm households in Malawi*

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Abstract: Our analysis of a rich representative household survey for Malawi, where patrilineal and matrilineal institutions coexist, suggests that (a) in matrilineal societies the likelihood of high value crop cultivation by a household increases with the extent of land owned by males, while the income generated from high value crop production decreases with the amount of land owned by females (b) cultivation of high value crops increases household welfare. The policy implication is that facilitating female ownership of assets through informal and formal institutions does not, on its own, increase welfare when appropriate complementary resources and institutions are absent. (98 words)

Keywords: female ownership of assets, informal institutions, cash crops, household welfare

JEL classification: Q12, O2, O13, J16

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Is women's ownership of land a panacea in developing countries?

Evidence from land-owning farm households in Malawi

1. Introduction

The pursuit of poverty reduction in developing countries has generally been associated with attempts to increase the capabilities and endowments of people through a variety of measures, such as investment in education and facilitation of asset ownership. In particular, there has been an emphasis on land ownership, land being the main form of asset that is expected to provide both economic security and social prestige in these countries. In a related discussion it has been argued that movement out of subsistence farming into commercial (or high value (HV) crop) production is a promising way out of poverty and establishing secure property rights of land is an important ingredient to this successful transition¹. Over the years, a gender dimension has been added to these policy initiatives. It is now argued that these policies should, in particular, facilitate development of capability and asset ownership among women.

Even as these policies are pursued in developing countries, it is well understood that there is widespread entitlement failure, making it difficult, in some cases impossible, to translate capabilities and asset ownership into (higher) earnings. A specific example of such entitlement failure, loosely speaking, is the inability of households to participate in the production of high value crops that can increase their income and hence their welfare. This form of entitlement failure is particularly acute among women, often on account of insecurity of property rights (Besley, 1995). In many contexts, often due to entrenched informal institutions, women's land rights are not at par with those of men (Agarwal, 1994). Sometimes women simply have no customary rights on land (Agarwal, 1988). In other cases they do, but the laws that underpin the property rights of women may be "difficult to enforce because they go against the grain of cultural practice" (Joireman, 2008, pp. 1238). Property rights can also

be weakened by other economic, social, cultural and ideological factors (Agarwal, 1994; Arun, 1999). They, in turn, can adversely affect women's ability to collateralize their land or other assets to gain access to capital and other resources that are important for the translation of asset ownership into income generating output.

Hence, even though participation in HV crop production is viewed as a means to empowering smallholders in general, and female smallholders in particular (Dolan and Sorby, 2003), and despite theoretical propositions and empirical evidence suggesting that enhanced asset ownership by women may be welfare enhancing (Quisumbing and Maluccio, 2003; Duflo and Udry, 2004; Doss, 2006; Luke and Munsri, 2011), it is by no means certain that female ownership of land per se would improve the welfare of the household. Specifically, female ownership of land, even when it is institutionalised, may not lead to the transition from subsistence to commercial or HV agriculture that is perceived to be welfare enhancing. In Gambia for instance, women used to be traditional rice growers and were given formal land titles. It was assumed that the introduction of better technology for rice in the form of pump irrigation would have a productivity enhancing effect on women. However, faced with constraints on access to credit and hired labour, women failed to adopt the new technology and remained traditional rice producers. By contrast, male allocation to the irrigated rice sector increased. This contributed to the increase in annual per capita income and food consumption, but on account of male allocation to the sector. Female economic empowerment played no role in it (von Braun, Puetz and Webb, 1989).

We contribute to the literature by examining the impact of land ownership on participation in high value agriculture, and by focusing on the gender differences of this impact. The context of our study is Malawi, where high value crops, such as tobacco and groundnuts have historically been considered welfare enhancing, and whose rural landscape is characterised by patrilineal and matrilineal land tenure systems. Matrilineal kinship places user

and control rights over land in the hands of women.² However, even as these social institutions of kinship gives women a degree of economic security not found in patrilineal systems, de facto their rights over land come with some uncertainties. Specifically, parents in matrilineal societies sometimes choose to break with tradition and pass the lands on to the male children, while maternal uncles can contest women's ownership of land (World Bank, 1991; WOLREC, 2011). Furthermore, men have significantly greater control over positions of power such as that of the village chief and female access to complementary resources such as credit, fertilizers and extension services is restricted (Peters, 2010; Nkonjera, 2011). We hypothesise that on account of both the growing uncertainty over land rights that reduces willingness to invest in cash crops (World Bank, 1991; Green and Baden, 1994), and limited access to complementary resources (Nkonjera, 2011), women's ownership of land may be negatively associated with the adoption of high value agriculture. The empirical results, while consistent with this logic, hold interesting nuances with respect to the particular type of interaction of de jure and de facto rights of male and female land ownership.

The rest of the paper is structured as follows: In Section 2, we outline the empirical methodology. The data are discussed in Section 3. In Section 4, we report and discuss the regression results. Section 5 concludes.

2. Empirical methodology

2.1. Econometric model

Heuristically, we model household welfare as being dependent on the exposure to high value crops, when the exposure to high value crops themselves are determined by the

interaction between de jure and de facto ownership of land between men and women in the households³. In other words, we estimate the following system of equations:

$$C = X_C \beta_C + \delta_C HV + \varepsilon_C, \quad [1]$$

$$HV^* = Z_{HV} \theta_{HV} + \mu_{HV} \quad (2)$$

In equation [1] C is our welfare measure for the i^{th} household, X_C are a set of j variables, β_C is the associated vector of coefficients, and δ_C captures the effect of exposure to high value agriculture on household welfare. The residual ε_C is assumed to follow normal distribution $\varepsilon_C \sim N(0, \sigma^2)$. We model household welfare as a function of the exposure to HV crops. In equation [2] HV^* is a latent variable measuring the likelihood of the household to be in the high value sector, Z_{HV} is a vector of explanatory variables, θ_{HV} is the associated vector of coefficient estimates and μ_{HV} is the error term. The latent variable HV^* is unobserved, but we observe $HV = 1$ when $HV^* > 0$ and $HV = 0$ otherwise. Under the assumption that μ_{HV} follows a normal distribution such that $\mu_{HV} \sim N(0,1)$, the corresponding specification is a probit model. Hence, $\Pr(HV = 1) = \Phi(Z_T \theta_T)$ and $\Pr(T = 0) = \Phi(-Z_T \theta_T)$, where $\Phi(\cdot)$ is a normal distribution function.

Note that our estimation strategy does not involve separate estimations of equations [1] and [2] to help address an important econometric issue. If equation [1] were to be estimated on its own with the use of ordinary least squares (OLS), treating HV as an exogenous variable would be erroneous. Households are unlikely to be randomly selected into the production of higher value crops, i.e. $E(\varepsilon_C | HV) \neq 0$. If households with genuinely higher or genuinely lower welfare are self-selected into the production of higher value crops, the OLS estimates of welfare are likely to be biased. Assuming that $(\varepsilon_C, \mu_{HV})$ follow a joint normal distribution of

the form $(\varepsilon_C, \mu_{HV}) \sim N(0,0, \sigma_\varepsilon^2, 1, \rho_{C,HV})$, where $\rho_{C,HV}$ is the coefficient of correlation, we therefore estimate a treatment effect model of household welfare, which accounts for the possibility of non-random selection of household into the high value market (Barnow et al, 1981). Specifically:

$$E(C | HV = 1) = X_C \beta_C + \delta_C + \rho_{C,HV} \sigma_\varepsilon \left[\frac{\phi(Z_{HV} \theta_{HV})}{\Phi(Z_{HV} \theta_{HV})} \right], \quad (3)$$

$$E(C | HV = 0) = X_C \beta_C + \delta_C + \rho_{C,HV} \sigma_\varepsilon \left[\frac{-\phi(Z_{HV} \theta_{HV})}{1 - \Phi(Z_{HV} \theta_{HV})} \right], \quad (4)$$

where $\phi(\cdot)$ is the normal density function. Hence, the difference in per adult equivalent expenditures between households self-selected into the high value agricultural sector and those not self-selected into the high value agricultural sector is:

$$E(C | HV = 1) - E(C | HV = 0) = \delta_C + \rho_{C,HV} \sigma_\varepsilon \left[\frac{\phi(Z_{HV} \theta_{HV})}{(1 - \Phi(Z_{HV} \theta_{HV})) \Phi(Z_{HV} \theta_{HV})} \right] \quad (5)$$

We estimate equation (5) using a full maximum likelihood method and obtain unbiased estimates of β_C , δ_C and θ_{HV} , henceforth referred to as the treatreg model. Note that the term in the brackets is the Mills ratio, which depends on the value of the High Value sector participation variable. A positive value of this selectivity term provides evidence in favor of underestimated levels of per adult equivalent expenditures on account of selection of individuals with genuinely higher living standards into the High Value agricultural sector, and vice versa in the case of a negative selectivity term. The correct effect of the HV variable on per adult equivalent expenditures has to be computed net of the selectivity bias.

One of the attractive features of the treatreg model is its flexibility with respect to identification, given that the normality in the probit model serves as an excluded condition. As a result, “the X and Z variables in the treatment and outcome equations can be the same

variables, if the user suspects that covariates of selection can also be covariates of the outcome regression. Similarly, X and Z can be different variables if the user suspects that covariates of selection are different from covariates of the outcome regression” (Guo and Frazer, 2014). In our empirical analysis, we experimented with both a just identified model and alternative specifications, in particular one that includes an exogenous excluded variable only in the decision equation), but the results (available upon request) remained robust to different specifications.

2.2. Empirical specification

In keeping with the literature, in our baseline specification for equation [1] we proxy welfare with the log of household level per adult equivalent expenditures and include in the specification variables such as age, gender and education of the household head and demographic composition of the household (Glewwe and Hall, 1998; Adams, 2004, 2006; Bhaumik, Gang and Yun, 2006; Dimova and Wolff, 2008). As robustness checks, we re-estimate our model with the use of standard poverty measures, such as poverty incidence, poverty depth and poverty severity. Due to space limitations, these results- which are qualitatively similar to those in the baseline regression- are available upon request. We considered further proxies of welfare, such as anthropometric child characteristics, but this reduced our sample by almost 50%.

As mentioned earlier, the main focus of this paper is the impact of de jure and de facto ownership of land by gender on HV crop production, i.e. on equation [2]. As indicated in Section 2.1., our HV variable takes the value of one if the household is involved in the production of HV crops. Given the nature of agricultural production in Malawi, the higher value category includes tobacco and groundnut production⁴. We experimented with cash crop production variable that also includes hybrid maize, the production of which has been

encouraged by the government over the past few decades as part of both its agricultural commercialisation and food security projects. The results across different definitions of cash crop-cum-high value crops do not differ significantly and due to space limitations we only report those based on tobacco and groundnuts.

We argue that not only per adult equivalent consumption, but also the probability of the household to undertake HV crop production depend on factors such as the age, gender, marital status and education level of the household head, as well as household dependency ratios. Specifically, education and age/experience are among the primary determinants of employability and earnings and are therefore positively associated with per adult equivalent expenditures both directly and by enhancing the household's entry into HV agriculture. By contrast, female headship and higher dependency ratio are assumed to have negative implications for household welfare both directly and via HV agriculture. We also introduce controls for whether the household head is involved in a monogamous or a polygamous relationship, where being single is the omitted category⁵.

We argue that ownership patterns may affect the decision to produce HV crops without directly affecting household consumption. Hence, we include only in the decision-making equation a number of variables that together capture the influence of ownership patterns of land on the decision to produce HV crops. Since these variables are not included in the second stage welfare equation, from an econometric point of view, they provide additional excluded variables over and above the normality of the probit model. Based on the literature and our understanding of the Malawi context, we are fairly certain that land ownership is exogenous in the decision equation. User rights over land are well established and driven by custom, with rights of transfer limited. Virtually no land market exists and transfer of land is driven by inheritance (Place and Otsuka, 2001). Indeed, detailed anthropological analysis indicates that "selling land out of lineage [is] not quite legitimate" (Berge et al, 2013, pp.9) and "bona fide

land holders are not allowed to rent out land according to law” (Berge et al, 2013, pp.10). To capture the possibility that land ownership by male and female household members affect the decision of the household to opt for HV production, we include both the actual land sizes owned by male and female family members and their interaction with a dummy variable that indicates whether the household belongs to a matrilineal or a patrilineal kinship group.

To verify whether there are any differences in welfare across kinship groups we include the dummy variable of matrilineal kinship in equation [2]. We do not have an unambiguous conceptual prior on the effect of kinship on welfare. On the one hand, there is evidence that patrilineal kinship may enhance household destitution due to abuse and welfare deteriorating male expenditure patterns in patrilineal societies (Benzer Kerr, 2005). At the same time, there is recent evidence that increasing competition over resources in matrilineal societies has direct negative implications on consumption and nutrition (Sear, 2008).

3.Data

We estimate equations [1] and [2] using the Third Integrated Household Survey (IHS3) of Malawi, conducted between March 2010 and March 2011. It is a representative survey for the whole territory of the country, conducted by the National Statistical Office of Malawi (2012), which received technical support from the World Bank as part of the World Bank’s Living Standards Measurement Study (LSMS). After accounting for missing observations and restricting the sample to those households who had access to land and derived income from agricultural production during the reference period, we are left with a sample of 7048 observations.⁶

The survey is informationally rich. It permits us to identify the exogenously given institutional drivers of land ownership, namely, matrilineal and patrilineal societies. Matrilineal systems are characteristic of the Yao and Chewa ethnic groups, while patrilineal systems are

associated with the Ngoni, Nkonde and Tumbuka ethnic groups. It is also possible to identify the total land size owned by each household member, as well as who in the household takes decisions over production and the use of income for each of the crops produced. As in any other LSMS survey, all remaining demographic and other characteristics that are part of our empirical specification, are available in the survey. Table 1A provides a description of all variables used in our empirical analysis.

As a start, we take a look at very rough cross tabulations on the relationship between land size and the probability of the household to be engaged in high value production (Figure 1) and between the probability of high value production and living standard measures such as per adult equivalent consumption and poverty headcount (Figure 2). We see that aside from a small non-linearity in the land size-high value production relationship among the first two quintiles of the land distribution, exposure to high value production is positively related to larger land ownership. This is consistent with the theoretical model and empirical results of Dimova et al (2015). Furthermore, high value crop production is generally associated with better living standards.

Basic descriptive statistics for the variables of interest to us (Table 1) further suggests that:

- Men dominate ownership of land. While, on average, women own more land (0.88 acres) than men (0.85 acres), in Malawian matrilineal societies, the difference is negligible. In patrilineal societies, on the other hand, men (1.16 acres) own about 40 percent more land than women (0.70 acres).
- Approximately 40% of households across both societies produce high value crops. However, significantly more income is generated from high value crop production in patrilineal compared to matrilineal societies. This is consistent with the possibility that increasingly insecure property rights in matrilineal societies affect negatively income

generation from high value crops. By contrast, in keeping with Benzer Kerr's (2005) proposition, we observe that per adult equivalent consumption is on average higher in households belonging to matrilineal compared to patrilineal societies. However, given that matrilineal societies tend to be located in the Southern and Central part of Malawi, while patrilineal societies are located in the North, as a robustness check in our more rigorous empirical comparison of the incomes generated from high value production we control for regional fixed effects.

4. Empirical results

Table 2 highlights the results from our baseline treatreg analysis of the impact of exposure to HV agriculture on welfare, conditional on institutional determinants of HV exposure. The first two columns of the Table highlight the baseline results, while the second two columns highlight the results based on an expanded specification controlling for regional fixed effects. We see that the impact of the HV agricultural dummy on per adult equivalent expenditures is positive and statistically significant at the 1% level, which supports the prior based on our descriptive statistics and earlier literature. To interpret the estimate correctly, it is necessary to compute the impact of the HV variable net of the selectivity effect, which is given by the difference between the absolute values of the coefficients of the HV variable and the coefficients of the Mills ratios. The coefficients of these variables across the two different specifications are 0.33 and 0.22, while the absolute values of the corresponding Mills ratios are 0.15 and 0.10. This indicates that in the baseline case, involvement in High Value agriculture leads to 18% increase in per adult equivalent expenditures of those involved vis-à-vis those not involved. Once we control for regional fixed effects, this percentage goes down to 12%.

In keeping with figure 1, larger land size is positively associated with entry into HV agriculture, irrespective of whether it is in the hands of male or female land owners. The precise

effect of male and female land ownership is difficult to interpret directly from the treatment results and hence we estimated separately the first stage probit model and computed the corresponding marginal probability effects of land size on entry into High Value agriculture. The results (available upon request) indicate that 1% increase in land availability for either males or females leads to approximately 5% increase in the household's chance of entry into High Value agriculture. At the same time, the interaction term between matrilineal kinship and male land ownership is positive and significant, indicating that larger male ownership in matrilineal societies stimulates entry into HV agriculture. In fact, the corresponding marginal effects indicate that there is approximately 50% increase in the chance of male land ownership in matrilineal societies to contribute to entry into HV agriculture compared to male land ownership in patrilineal societies. The interaction terms of matrilineal kinship and female land ownership are insignificant. This is consistent with the literature based arguments that in an environment where complementary resources and norms favour male as opposed to female involvement in more remunerative technologies or crops, female de facto land ownership and associated social norms in themselves are not a panacea to welfare deteriorating choices. The results are robust to the inclusion of regional fixed effects.

Land ownership patterns appear to be the key drivers to entry into high value agriculture. The only other significant variable in the HV entry equation is higher education, which rather counter intuitively has negative impact on entry into HV agriculture.

Looking at the non-HV agriculture based determinants of welfare, we see that in keeping with Karr (2005) matrilineal social norms have positive (as a corollary, patrilineal social norms have a negative) impact on welfare. As expected and in keeping with our priors, higher education is generally positively related to per adult equivalent expenditures, while female headship has negative impact on per adult equivalent expenditures. While young dependency ratios are negatively related to per adult equivalent expenditures, old dependency

rations (proportion of household members above the age of 60) are positively associated with per adult equivalent expenditures. This is consistent with the possibility of greater contribution of older people to income generation and consequently consumption in the household than children.

While our main empirical focus so far was on the determinants and welfare implications of exposure to HV agriculture (compared to non-HV agricultural occupational choices), our descriptive statistics indicated that there may be some differences in the institutional determinants of the actual income generated from high value agriculture. Hence, as a further extension and robustness check, we estimate a version of the model that uses the proportion of income generated from high value agriculture as a substitute to the dummy variable of exposure to HV agriculture. Given that the treatreg model belongs to the family of instrumental variable models- and is more efficient than the standard 2SLS for a situation where the endogenous variable is binary- its continuous endogenous variable analogy is the standard 2SLS, which we estimate with the use of the ivreg command in Stata. As argued earlier, the literature on Malawi provides ample evidence to suggest that our land ownership variables for males and females are exogenous in the HV income generation equation. The standard tests available for the 2SLS model suggest that income generated from HV production is not exogenous in the per adult equivalent consumption equation. In addition, the specification passes the Sargan and Basman tests for overidentified restrictions, granting some support to our choice of excluded instruments.

These results, highlighted in Table 3, are broadly consistent with those based on exposure to HV agriculture. We see that the effect of the share of income generated from HV agriculture is strongly positively associated with welfare. To be precise, the corresponding marginal effects (available upon request) indicate that a 1% increase in the share of income generated from High Value agriculture leads to approximately 1% increase in welfare. As in

the case of exposure to HV agriculture, the size of land per se, irrespective of whether it is in the hands of male or female owners has positive impact on HV agriculture income. However, in contrast to the results in Table 2, we observe that both the matrilineal dummy variable and the interaction term of matrilineal kinship and female ownership are negative and significant. The significance of the matrilineal dummy disappears after controlling for regional fixed effect, but the interaction terms continue to be negative and significant, in fact, its significance level increases. This indicates that female ownership in matrilineal societies has negative implications for the ability of the household to generate income through high value agriculture and grants further support to our earlier observation that female empowerment itself may not be a panacea for household welfare problems.

Conclusion

In the development literature and policy making, increasing per adult equivalent household expenditure and, correspondingly, poverty alleviation, is an end in itself. At the same time, there is strong advocacy in favour of increasing the incidence and extent of asset (primarily land) ownership of women, based on extant literature that highlights various beneficial influences of female ownership. These parallel discussions ignore that possibility that while asset ownership by women may be empowering, it may not produce the desired positive impact on household welfare in circumstances when women do not have adequate access to markets and complementary resources such as capital and hired labour. Alternatively, women may be less willing to take the risks associated with high-return use of these assets, or undertake necessary complementary investments, if their de facto property rights are weak. In such cases, even in contexts where social norms guarantee women ownership of assets (such

as land), household per adult equivalent consumption (and hence welfare) may ironically be better served if men are de facto allowed to own (or control) significant amounts of these assets.

We examine this proposition within the context of Malawi, where patrilineal and matrilineal societies co-exist in mutually exclusive geographical locations. Our results suggest that while household per adult equivalent consumption (and hence welfare) is enhanced by high value crop production, the likelihood of cultivating these crops in matrilineal societies increases with the amount of land owned by men in the households. Furthermore, the share of income generated through high value agriculture is negatively associated with the amount of female ownership of land by women in these societies.

In other words, there is at least weak evidence to suggest that de jure female ownership of assets may not be a panacea in developing economy contexts; household interests may be better served by male ownership of these assets, either because men in these contexts have better access to complementary resources that enable them to deploy the assets in ways that enhance returns to them, or because uncertainty about property rights induce women to take less risk or under-invest in these assets.

The policy implication is that female ownership of assets cannot be approached piecemeal, and in order to make it consistent with the equally important objective(s) of enhancing household welfare (and poverty alleviation) a wider and holistic approach has to be adopted. Along with de jure ownership of assets (such as land), women need to be assured of their long term property rights. As the empirical evidence presented in this paper indicates, this may not always be the case and assurance of property rights may therefore involve the enactment and enforcement of formal laws which violate traditional institutions such as the social norms that work to undermine women's property rights. Moreover, women should have improved access to complementary resources and other factors (such as capital and market access) that are required to generate significant returns on assets (such as land) over which they have ownership

(or control). In other words, while women's ownership of assets may be a necessary condition for both female empowerment in developing countries and for enhanced household welfare, on its own ownership cannot guarantee either of these objectives. While this has been recognised in discussions about the interaction between ownership, institutions (including uncertainty about property rights) and access to resources in contexts where the units of assessment are firms, there are few evidence-based discussions in the context of households. This paper adds to that evidence-based discussion and thereby makes a significant contribution to the related yet somewhat parallel literatures about female ownership of assets and economic development (through household welfare).

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Table 1

	Full sample	Matrilineal	Patrilineal
Land size controlled (acres)			
By male	0.91 (1.53)	0.85 (1.53)	1.16 (1.61)
By female	0.88 (1.24)	0.88 (1.24)	0.70 (1.24)
High value crop production			
Household produces high value crops	0.41 (0.49)	0.40 (0.49)	0.41 (0.49)
Share of income generated from high value crops	0.14 (0.47)	0.11 (0.25)	0.29 (0.98)
Household per adult equivalent consumption			
All households	64388 (68586)	65608 (72095)	58495 (47755)
N of observations	7048	5839	1209

Note: The figures in brackets are standard deviations. The differences in means across matrilineal and patrilineal were tested and are significant in all cases.

Table 2: Baseline specification: Exposure to HV agricultural production and welfare

	No regional fixed effects		With regional fixed effects	
Constant	11.19 (0.04)***	-0.62 (0.11)***	11.22 (0.06)***	-0.49 (0.11)***
Head age	-0.007 (0.001)***	0.002(0.001)	-0.01 (0.001)***	0.001 (0.002)
Female head	-0.07 (0.03)**	0.01 (0.06)	-0.07 (0.03)**	-0.004 (0.07)
Monogamous	-0.15 (0.03)***	0.08 (0.06)	-0.15 (0.03)***	0.01 (0.07)
Polygamous	-0.18 (0.03)***	0.12 (0.08)	-0.17 (0.03)***	0.06 (0.08)
Proportion 6	-0.68 (0.04)***	0.01 (0.08)	-0.69 (0.04)***	-0.05 (0.10)
Proportion 7-15	-0.77 (0.04)***	0.05 (0.09)	-0.77 (0.04)***	0.03 (0.09)
Proportion 60	0.20 (0.05)***	-0.02 (0.10)	0.20 (0.05)***	0.003 (0.11)
Primary	0.26 (0.02)***	0.05 (0.05)	0.26 (0.02)***	0.05 (0.05)
Secondary	0.52 (0.02)***	0.003 (0.05)	0.51 (0.02)***	0.01 (0.05)
Higher	1.36 (0.06)***	-0.47 (0.14)***	1.33 (0.06)***	-0.51 (0.14)***
Matrilineal	0.13 (0.02)***	-0.04 (0.06)	0.06 (0.04)	-0.04 (0.11)
Female land size		0.12 (0.03)***		0.14 (0.03)***
Male land size		0.13 (0.02)***		0.12 (0.02)***
Female land size*matrilineal		-0.02 (0.03)		-0.03 (0.03)
Male land size*matrilineal		0.08 (0.11)***		0.06 (0.03)**
High value exposure	0.33 (0.05)***		0.22 (0.07)***	
Mill's Ratio	-0.1529*** (0.0309)		-0.1007*** (0.0417)	
LR test of independent equations	Chi2 (1)=4.55 Prob>Chi2=0.0329		Chi2 (1)=6.07 Prob>Chi2=0.0138	
N of observations	7048		7048	

Note: The figures in brackets are standard errors. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Table 3: Determinants of income share of HV agriculture and welfare consequences

	No regional fixed effects		With regional fixed effects	
Constant	11.16 (0.06)***	0.08 (0.02)***	11.28 (0.06)***	-0.01 (0.03)
Head age	-0.01 (0.0007)***	-0.0002 (0.0003)	-0.01 (0.0007)***	-0.0002 (0.0003)
Female head	-0.04 (0.03)	-0.02 (0.02)	-0.04 (0.03)	-0.02 (0.02)
Monogamous	-0.14 (0.03)***	0.003 (0.02)	-0.14 (0.03)***	-0.0004 (0.02)
Polygamous	-0.17 (0.04)***	0.01 (0.02)	-0.16 (0.03)***	-0.001 (0.02)
Proportion 6	-0.65 (0.05)***	-0.02 (0.02)	-0.67 (0.05)***	-0.03 (0.02)
Proportion 7-15	-0.79 (0.05)***	0.02 (0.02)	-0.79 (0.04)***	0.02 (0.02)
Proportion 60	0.21 (0.05)***	-0.02 (0.02)	0.21 (0.05)***	-0.02 (0.02)
Primary	0.22 (0.03)***	0.04 (0.01)***	0.23 (0.03)***	0.04 (0.01)***
Secondary	0.51 (0.02)***	-0.001 (0.01)	0.52 (0.02)***	-0.003 (0.01)
Higher	1.34 (0.06)***	-0.03 (0.03)	1.33 (0.06)***	-0.03 (0.03)
Matrilineal	0.20 (0.03)***	-0.04 (0.01)***	0.06 (0.05)	0.03 (0.02)
Female land size		0.02 (0.01)***		0.03 (0.01)***
Male land size		0.03 (0.01)***		0.02 (0.006)***
Female land size*matrilineal		-0.02 (0.01)***		-0.03 (0.007)***
Male land size*matrilineal		-0.003 (0.01)		-0.004 (0.006)
Income share of HV agriculture	1.34 (0.03)***		0.85 (0.21)***	
Test of endogeneity	H0: Share HV exogenous Durbin Chi2(1)=35.29 (p=0.0000) Wu-Hausman F (1,7034)=35.40 (p=0.000)		H0: Share HV exogenous Durbin Chi2(1)=19.25 (p=0.0000) Wu-Hausman F (1,7032)=19.26 (p=0.000)	
Test of overid restrictions	Sargan Chi2(3)=4.72 (p=0.1934) Basmann Chi2(3)=4.71 (p=0.1940)		Sargan Chi2(3)=3.71 (p=0.2942) Basmann Chi2(3)=3.70 (p=0.2951)	
N of observations	7048		7048	

Note: The figures in brackets are standard errors. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Figure 1: Incidence of High value production by land size quintile

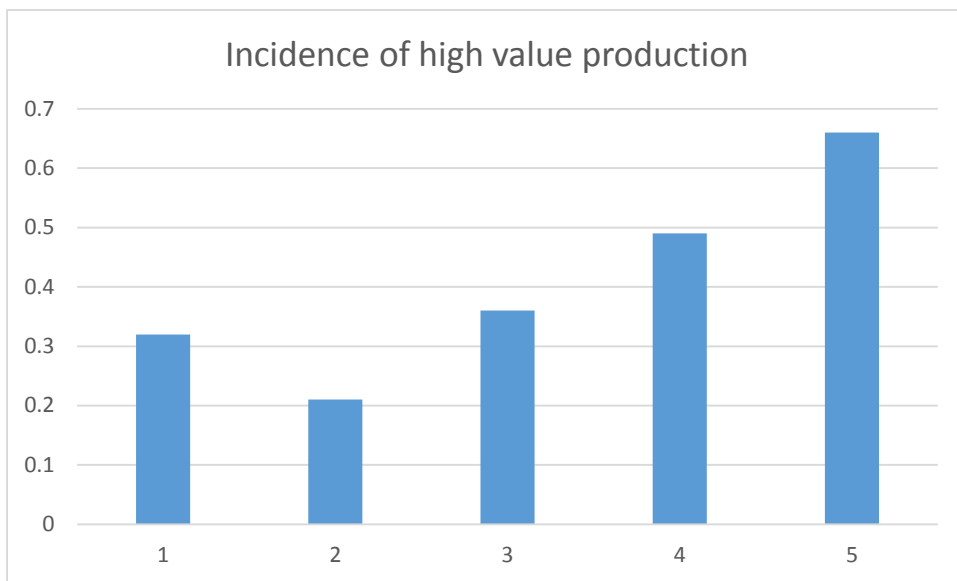
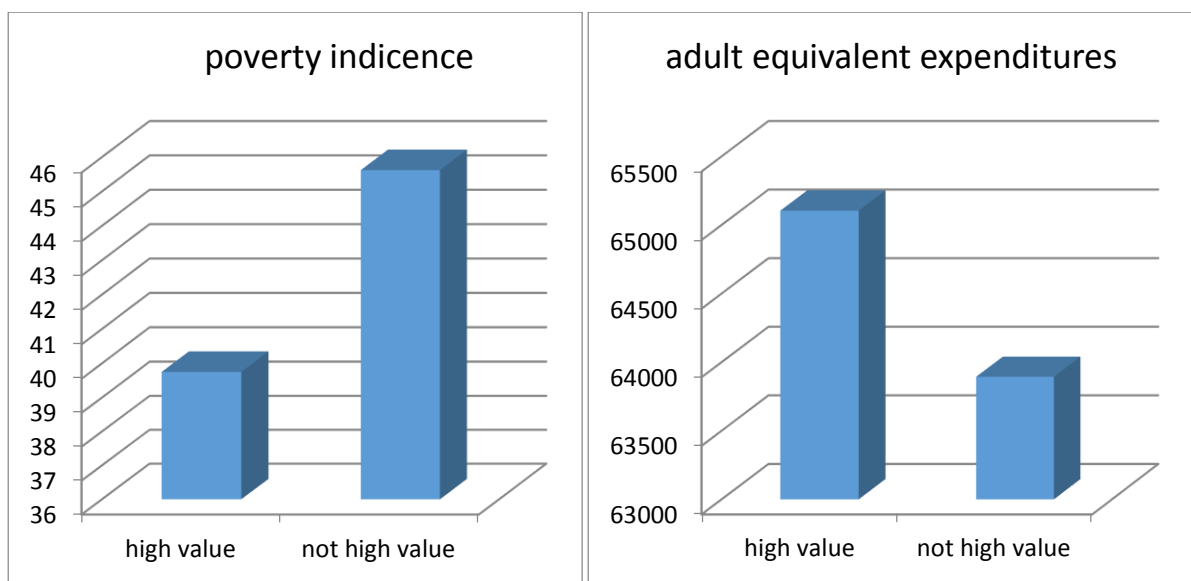


Figure 2: Welfare implications of High value production



Appendix

Table 1A: Description of variables used

Head age	Age of the head of household
Female head	Dummy=1 if the head of household is female
Monogamous	Dummy= 1 if the head of household is in a monogamous union
Polygamous	Dummy= 1 if the head of household is in a polygamous union
Proportion 6	Proportion of family members of age 6 or lower
Proportion 7-15	Proportion of family members between ages 7 and 15
Proportion 60	Proportion of family members of age 60 or higher
Primary	Dummy=1 if the head of household has primary education
Secondary	Dummy=1 if the head of household has secondary education
Higher	Dummy=1 if the head of household has tertiary education
Matrilineal	Dummy=1 if the household belongs to a matrilineal kinship group
Female land size	Total land size in acres owned by female family members
Male land size	Total land size in acres owned by male family members
Income share of HV agriculture	The share of HV agriculture income in total household income
HV exposure	Dummy=1 if the household produces any high value crops

¹ Note that agricultural commercialisation is typically associated with greater agricultural productivity and the focus of much of the related literature performs productivity estimates. By contrast, our main interest is not on productivity assessment, but on the link between institutions and the household's exposure to high value crop production on the one hand, and between high value crop production and household welfare, on the other hand. In what follows, we use HV crop production as a proxy for exportable commercial crops - tobacco and groundnuts - in Malawi (see also footnote 4). This distinguishes our case for instance from a situation of commercialisation in the form of enhanced productivity of food crops like rice by way, for instance, of enhancing smallholders' access to irrigation.

² In the patrilineal land tenure system, typically found in the Northern parts of the country among the Ngoni, Ngonde and Tumbuka ethnic groups, sons inherit land directly from their fathers and women can only gain user rights to land through their husbands. Virilocal residence (that is, having the man's village as the matrimonial home) is customary for patrilineal kinship systems and the man pays lobola or bride price to the wife's parents to establish his right to take his wife and children to his own village. By contrast, in the matrilineal land tenure system, characterising the Yao and Chewa ethnic groups, residing predominantly in the Southern and Central parts of the country, women have the primary rights to land through their lineage. Husbands can seek land from the village headman or their in-laws, but do not automatically retain rights to wife's land in the event of divorce or female landowner's death (Green and Baden, 1994).

³ Note that we do not consider intra-household bargaining. We are only interested in the effect of institutions on the exposure of the household to high value agriculture, while welfare is a household level outcome of this exposure and is proxied as an average across household members.

⁴ In the early post-independence years the country followed the typical sub-Saharan policies of heavy government involvement and stimulation of cash crops (predominantly tobacco) at the expense of food crops. Agriculture was subdivided into two sectors, roughly contributing to 70 percent and 30 percent of the agricultural GDP, respectively: (i) smallholder sector made up predominantly of maize producing farmers, the majority surviving at the bare subsistence level (Devereux, 1999; Whiteside, 2000), and (ii) cash crop (mainly tobacco dominated) sector with production concentrated in estates. As in other sub-Saharan African countries, the dramatic change in terms of trade during the late 1970s (together with external shocks like the war in Mozambique and a severe draught in the early 1980s) paved the way for IMF and World Bank led adjustment programs, including, among others, active encouragement of smallholder involvement in the production of exportable cash crops such as tobacco and groundnuts and adoption of higher value hybrid maize varieties. Although the adjustment policies were subject to multiple stop-and-go experiences, mainly on account of renewed food crises and changes in political ideology, the change in regime did result in an increased production of higher value crops, especially hybrid maize by smallholders (Harrigan, 2003).

⁵ We thought of theoretical conceptualisations that would give more (institutional) meaning to these variables. However, polygamy does not appear to be widespread in Malawi; less than 10% of the unions in our sample are polygamous. Hence, no interactions that we attempted turned out to be significant. We therefore treat both indicators of marriage simply as controls in our empirical specifications.

⁶ To arrive at this sample size we further restrict to households that are clearly either “matrilineal” or patrilineal” as explained in the next paragraph. We base all the analysis on this sample of 7048 observations.