# Female Engagement in Commercial Agriculture, Interventions and Welfare in Malawi

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**What Works for the Poorest?**

## Abstract

The poverty and extreme poverty alleviating potential of female empowerment through agricultural commercialisation has been an increasing focus of much of the recent development literature and policy discourse. Using representative data from Malawi, this chapter looks at the role of key policy interventions on the probability for women to enter the commercial agricultural sector and the impact of agricultural commercialisation on poverty and extreme poverty. We find that (i) Most interventions had positive impact on female food commercialisation, but either did not affect or affected negatively female entry into high value agriculture, (ii) Female empowerment through high value agriculture benefitted the poor and extreme poor. We conclude that gender norms in food commercialisation and high value agriculture should be understood for female empowerment interventions of the type implemented in Malawi to have the desired effect.

Keywords: Female empowerment, commercial agriculture, policy interventions, Malawi

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## 1. Introduction

Throughout sub-Saharan Africa, lucrative commercial crops are typically perceived as "male crops", while lower value crops for home consumption are perceived as "female crops" (Kasante et al, 2001; Dufflo and Udry, 2004). However, the potential of engaging female agricultural producers in high value crop activities has received increasing attention in the academic literature and policy discourse. The argument is that female cultivation of "male crops" should not only bolster women's economic empowerment, but also improve overall household welfare and nutrition, especially that of children (Haddad and Hoddinott, 1994; Dolan and Serby, 2003). There is related evidence that cash crop production is superior to reliance on subsistence farming, even in the context of rising food prices (Dimova and Gbakou, 2013; von Braun and Kennedy, 1994; Wood et al, 2013).

Malawi is one of the poorest countries in the world and is predominantly agricultural. It shares key characteristics with many other poor tropical African economies, namely a comparative advantage in tropical cash crop activities, and it is threatened by food insecurity, especially in an environment of rising food prices and potential droughts. Children are among the most high profile victims of food insecurity. According to ORC Macro (2006) about half of the children age 0-59 months are chronically stunted and the proportion of stunted children is 24 times the level expected in a healthy well-nourished population. Furthermore, about one third of all under five deaths in Malawi is related to moderate or severe malnutrition. Exploring (i) the choice across food and cash crops among farmers- in particular female farmers- and the effect of policy interventions that facilitate the latter, and (ii) the impact of this choice poverty and extreme poverty indicators, is therefore of utmost importance.

While we know that significant barriers, such as lack of access to production inputs, especially fertilizers and credit, and technology, prevent women from cultivating higher-value cash crops, we know less about the consequences of interventions that remove these barriers and allow women to cultivate more lucrative commercial crops. The positive implications of removing barriers to female engagement in commercial agriculture tend to be taken for granted. However, von Braun, Puetz and Webb (1989) document a counter-intuitive effect of one such intervention. In Gambia, where women were traditional rice growers, it was assumed that introduction of better technology for rice in the form of pump irrigation would enhance their income generating potential. But faced with constraints on access to credit and hired labour, women failed to adopt the new technology and remained traditional rice producers. In contrast, men moved into the irrigated rice sector. This attempt at female economic empowerment played no role in household welfare enhancement. We do not know to what extent this result is generalizable. There are significant gaps in the literature related to both the determinants of female empowerment through high value agriculture and on its effect on household welfare indicators, such as overall household poverty. Research on whether the poorest are completely excluded from this process is even rarer.

Using a representative household survey from Malawi, we look at policy based determinants of female engagement in commercial agriculture and at the effect of such engagement on poverty (and extreme poverty) measures. We explore both the potential transition from purely subsistence oriented staples into higher yielding food varieties, such as hybrid maize, and the

entry of females into high value crops such as tobacco, which have traditionally been a high income generating male prerogative. Entry into higher value activities like tobacco, while profitable, has unclear implications for household poverty and nutrition. In a context like Malawi, where production is rain-fed and not mechanized, this is an inherently risky and expensive venture, potentially open to only households who have crossed a certain asset- particularly land size - threshold (Wood et al, 2013; Dimova et al, 2015 ). Given incomplete markets and high population density and shrinking land sizes, it often comes at the expense of staple crop production on the farm. This potentially exposes uninsured smallholders to unexpected food price increases that limit their purchases of additional food required after foregoing staple food production and is of particular significance to the ultra poor (Sahn and Arulpragasam, 1991; Dimova et al, 2015).

Recent poverty and malnutrition oriented agricultural interventions in Malawi, such as allocation of coupons for seeds and fertilizers and credit, have explicitly targeted poor and ultra-poor households - particularly those headed by women- and have aimed at assuring diversification out of subsistence into more profitable cropping activities. Explicitly focusing on women is expected to close the male-female earnings gap, a large proportion of which is explained by differential entry into high value cropping activities (Kilic et al, 2013A). At the same time, it is unclear whether entry into such profitable activities would necessarily enhance household welfare and pull households out of poverty.

On the one hand, differential spending behaviour on the part of men and women, with women presumably devoting larger proportions of their incomes to nutrition and household (in particular child) welfare enhancing expenditure categories, is expected to have positive implications for household welfare (Dufflo and Udry, 2004). On the other hand, barriers to complementary resources like land, labour and relevant networks may make females less productive within the same agricultural niches than males (Udry, 1996; Udry and Goldstein, 2008), and hence prioritizing female as opposed to male entry into the highest income niches may lead to lowering the income status of households as a whole. To the best of our knowledge, there is yet no unambiguous answer to the question of whether the types of agricultural interventions implemented in Malawi are effective in assuring successful (female) entry into higher income niches, and in turn, whether entry into higher value niches has necessarily been poverty and under-nutrition alleviating. We address this question with a specific focus on the issue of gender and those belonging to the poor and ultra- poor percentiles of the income distribution.

## 2. Context and policy environment

Predominantly agricultural Malawi is one of the poorest countries in the world, ranking 174$^{th}$ out of 187 countries according to the Human Development Index of 2014. – Between 2007 and 2011, on average 61.6 % of the population fell below the international poverty line of USD 1.25. According to the Third Integrated Household Survey of Malawi for 2010-2011 used in this chapter, 18.97% of the population are ultra-poor, or falling below the internationally accepted nutritional minimum.

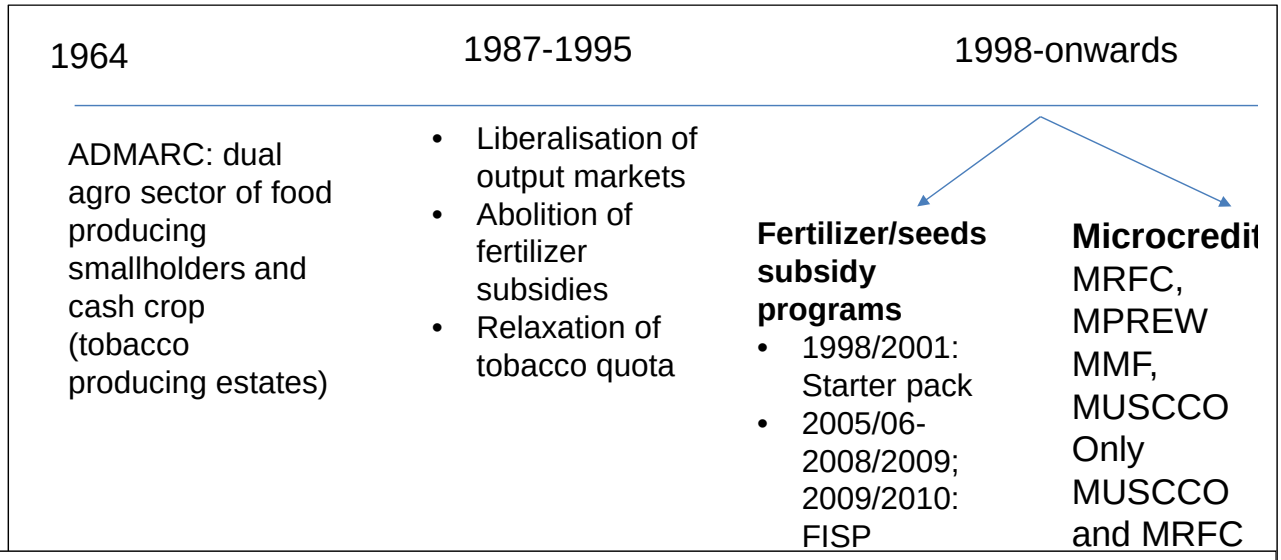
Malawi shares key characteristics of many other sub-Saharan African economies - for example, a comparative advantage in tropical cash crop activities - and it is threatened by food insecurity in an environment of rising food prices and occasional severe droughts. While the poorest (subsistence) farmers have typically been shown to restrict themselves to low-risk and low-return subsistence activities, there are significant entry constraints in pursuing more lucrative crop choices, including tobacco, hybrid maize and groundnuts. These constraints are a historical legacy of the 1970s-1990s policy environment, characterised by heavy government involvement and stimulation of the large scale, estate based, high value sector (predominantly tobacco) at the expense of the food crop sector.

Between independence in 1964 and the late 1990s, all key agricultural decisions, such as extension, technological development and the marketing of agricultural output, were taken by the Agricultural Development and Marketing Corporation (ADMARC), which sold inputs to and bought produce from farmers. The corporation divided agriculture into two subsectors, a smallholder sector made up of predominantly subsistence oriented producers, and a cash crop sector with production concentrated in estates. These two subsectors contribute 70 percent and 30 percent of the agricultural GDP, respectively. The prices of key staple crops, such as maize, were kept artificially low, while all revenues were channelled into the development of the cash crop estate sector, viewed as the engine of growth.

As in other similar sub-Saharan economies, the dramatic change in the terms of trade during the 1970s (together with other external shocks, such as the war in Mozambique and a severe drought in 1979-80) highlighted the failure of government led, agricultural export based policies. A series of food crises paved the way to IMF and World Bank led adjustment programs, including active encouragement of smallholder involvement in the production of exportable cash crops, such as tobacco and groundnuts; and the adoption of higher value hybrid maize varieties. Together with a discontinuation of maize fertilizer subsidies, these policies contributed to a significant reallocation out of food crops into cash crops among smallholders (Harrigan, 2001). But severe drought in 1992-1994 and a renewed food crisis contributed to a further re-thinking of input based government strategies for poor smallholders, among the most prominent being the (pro-poor) allocation of fertilizer subsidies and credit to Malawian households.

Text box 1 highlights the timeline of agricultural policy developments in Malawi since independence. One of the most highly discussed elements in post-1990s policy timeline is the fertilizer input and subsidy program (FISP) which started in the late 1990s and continued through the 2000s. The programme was developed out of the Starter Pack of 1998. It was administered through a series (and multi-period) sub-programmes of coupon voucher allocations, enabling households to purchase fertilizer, hybrid seeds and pesticides at reduced prices (Dorward and Chirwa, 2009). The four criteria to identify beneficiaries were that (i) households should own land, which is cultivated in the relevant season, (ii) households should be bona fide residents of the village, (iii) only one beneficiary should be eligible in a household, and (iv) vulnerable groups, especially households headed by women, should be given priority.

**Text box 1: Agro-policy timeline**




**Selected impact evaluation studies**:

- Coady et al (2002), Holden and Lunduka (2010), Kilic et al (2013B): re-distribution of coupons in favour of relatively better off and male headed households
- Diagne and Zeller (series of papers on access to credit): no direct effect on income and nutrition; targeted credit may have negative impact on food security
- More recent gender related studies- Kilic et al (2013A)- male-female productivity gap mostly explained by endowments, especially access to cash crop production

The prolific literature evaluating either the direct or the indirect (via enhancing the potential of smallholder entry into higher productivity income generating niches in the agricultural market and their subsequent productivity) effects on poverty and nutrition is inconclusive. If anything, the dominant view appears to be that - contrary to programme design and intentions - coupons for seeds and fertilizers tended to be allocated in favour of relatively better off households (Coady et al, 2002; Holden and Lunduka, 2010; Kilic et al, 2013B).

Complementary programs aimed at encouraging diversification and enhanced productivity of the rural sector- though receiving significantly less attention in the literature- have been the proliferation of rural (micro)-finance credit and corresponding institutions, aiming the enhancement of access to credit for smallholders. These include the Malawi Rural Finance Company (MRFC) - a state-owned and nation- wide agricultural credit program; the Micro-enterprises for rural women (PMERW) - a programme explicitly targeting women; the Malawi Mudzi Fund (MMF), a replica of the Grameen Bank; and the Malawi Union of Savings and Credit Cooperatives (MUSCCO), a local saving and credit union. Among the numerous programmes and credit allocation institutions, only MRFC and MUSCCO have national coverage. Once again, as in the case of the FISP, the results of impact evaluation studies are

inconclusive. In fact, Diagne and Zeller (2001) argue that by promoting the reallocation of smallholder land from food to cash crop production, micro credit programmes may have had a negative impact on food security.

Furthermore, the literature concurs that entry barriers to both the agricultural input market and (thereafter) to high productivity agricultural sector niches continue to be highest for women. Very recent research attributes most of the productivity (and hence income) gender gap in Malawi to low access to higher value activities like tobacco production and to inputs in the production process (Kilic et al, 2013A). At the same time, we do not know whether these identified constraints to female entry into both the input and the output agricultural markets matter for household welfare and how effective government action may be in dismantling these barriers.

## 3. Empirical methodology and specification

We model stylised measures of poverty and extreme poverty as depending on female engagement in commercial agriculture, where female engagement in commercial agriculture is, in turn, a result of a set of government policies, such as access to credit, extension services and other inputs in the production process; and household endowments, including land and human capital.

In doing so, we employ sophisticated econometric techniques, which allow us to produce unbiased estimates of the effect of female engagement in commercial agriculture on poverty or other measures of household welfare. Specifically, we acknowledge the fact that women engaged in commercial agriculture are unlikely to be a randomly selected sample. If women from households with either genuinely higher or genuinely lower welfare are self-selected into commercial agriculture, estimates that do not take this into account would be biased. For the purpose, we estimate a treatment effect model of household welfare, which accounts for the possibility of non-random female selection into commercial agriculture, The appendix offers a brief and fairly non-technical outline of this empirical procedure, while more technical description of the model can be found in Dimova and Wolff (2008) and Guo and Frazer (2010).

In our baseline estimation we use per adult equivalent food consumption as a poverty measure, which also implicitly takes into account potential under-nutrition. To assess explicitly the impact of female entry into commercial agriculture on the poorest, we re-estimate the model using the incidence of extreme poverty as a dependent variable. Since extreme poverty takes the value of one if the household is extremely poor and zero otherwise, we estimate a biprobit model, which is the appropriate for this case empirical version of the treatment effect model described earlier. The results that we report in the next section only account for the direction of different economic relationships explored. The full set of empirical results are presented in the Appendix.

In each estimation we take into account human capital characteristics, distinguishing between households whose head has tertiary, secondary or primary education, the baseline variable being no education. In keeping with the literature, we expect higher levels of education to be associated with both higher probability of entry into commercial agriculture and lower

probability for the household to be ultra- poor or constrained its food consumption. We also control for the age and marital status of the head of households, as well as for the gender of the head of household. Female headed households are expected to face higher probability of female entry into commercial agriculture, but also lower probability than male households of being lifted out of poverty.

To avoid reverse causality issues with the policy related variables (namely, the possibility that relatively better off households may have a better access to productivity and welfare enhancing policy interventions) we experiment with relevant variables at the village, as opposed to the household level. In particular, we look at the female empowerment implications of village level access to either extension services or capital. To explicitly capture the access of women to either coupons for the purchase of either seeds or fertilizers or credit, we also control for the share of females in the village who were able to obtain coupons in the reference period and the share of females in the village who were able to obtain a loan for use in agricultural production.

## 4. Data

We perform our empirical estimations using the Third Integrated Household Survey (IHS3) of Malawi, conducted between March 2010 and March 2011. This 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 9025 observations.

The survey is informationally rich. Aside from the usual for LSMS surveys detailed information on consumption and income, as well as human capital and household characteristics, there is detailed information on ownership and engagement in different agricultural and non-agricultural activities, such that we are able to identify the owner of assets such as land and determine whether the person responsible for commercial agricultural production is a male or a female. In addition, there is rich information on access to all relevant services- credit, coupons for agricultural inputs and extension services- used by the government as a means to encourage commercial agricultural production.

As a start, we take a brief look at the links between commercial agriculture, which given the specific Malawi context, we proxy with the probability of producing either tobacco or hybrid maize and the probability of households to be engaged in commercial agriculture. We focus explicitly on female engagement in commercial agriculture, which is proxied by female control over the cash crop production and marketing process.

The cross-tabulations in Figure 1 indicate that there is strong association between the probability of engaging in either tobacco or hybrid maize production and the probability of not falling in the category of ultra-poor households. Note that in our definition of the ultra-poor category, we use the methodology adopted by the World Bank in the collection of the IHS3 data. Specifically, the survey defines a total poverty line, which has two principal components, a food component and a non-food component. The food poverty line is the amount of expenditures below which a person cannot meet the WHO recommended calorie requirements of 2400

calories a day. This amounts to approximately 27.5 MK per person per day. Households falling below the food poverty line defined this way are considered ultra-poor. By contrast, the non-food component of the poverty line is calculated as the weighted average of non-food expenditures of people that are either 5% below or 5% above the food poverty line. The total poverty line defined as the sum of food and non-food poverty lines described above is estimated as 44.3 MK per person per day and households falling below this line are considered poor.

The results are not significantly driven by the gender of the household member responsible for either type of commercial agriculture. At the same time, we see a significant gender gap in engagement in commercial agriculture (Figure 2). While 15.28% of male agricultural producers are engaged in tobacco production, the corresponding female sample is less than 2%. Similarly, 46.69% of the male agricultural producers are engaged in hybrid maize production, while the corresponding female sample is only 15.86. As indicated in Figure 3, males are also more likely to receive either loans or coupons for seeds and fertilizers than females, although the gap is not as large as the gender gap in engagement in commercial agriculture.

<<<<<<< **INSERT FIGURES 1, 2 and 3 ABOUT HERE**>>>>>>>

## 5. Empirical findings

In Table 1 we highlight the direction of the relationship between the various policy interventions and female entry into commercial agricultural activities, while in Figure 4 we plot the coefficients of the impact of female agricultural commercialisation on our two measures of household welfare.

<<<<<<<<<<<<<<**Insert Table 1 and Figure 4 about here**>>>>>>>>>>>

The results indicate that while female ownership of land and extension services have unquestionable positive impact on the probability of women to be involved in commercial agriculture, the effect of alternative intervention is ambiguous and dependent on the type of agricultural commercialisation. Village level access to finance as well as coupons for agricultural inputs and targeted allocation of loans to women have a positive impact on the probability of women to adopt higher value hybrid maize production. However, village level access to finance and targeted allocation of loans does not have any impact on the involvement of women in tobacco production, while allocation of coupons has a negative impact on the probability of women to enter the highest value tobacco sector. The results highlighted in Figure 4 indicate that female agricultural commercialisation reduces significantly the probability for the household to be ultra-poor and increases significantly its per adult equivalent food consumption. The effect of food commercialisation in the form of adopting hybrid maize production on the latter is almost twice stronger than the effect of commercialisation by adopting tobacco production.

Taken together these observations are consistent with the evidence on Gambia presented by von Braun et al (1998), in the sense that perceptions on gender roles in specific crop production

need to be properly understood for the intended intervention to have a desired effect. In the case of Malawi, we see that policy based encouragement of a technologically more advanced version of food production had the desired effect on women, but did not enhance their involvement in the "male crop" production sector. It is also important to note that while female ownership of land encourages female entry into higher productivity niches, male ownership of land discourages it. This feeds into the ongoing debate on envisaged land reforms in Malawi (Peters, 2007).

## 6. Conclusions and policy implications

The focus of this chapter is on disentangling the impact of policies aimed at encouraging poor farmers' (especially female) entry into lucrative agricultural niches, and – in turn – the effect of female entry into these niches on a household welfare (proxied with per adult equivalent consumption) and the probability to be ultra-poor. Overall, the policy implications of our empirical analysis are mixed. On the one hand, our descriptive statistics do not highlight any substantial gender differences in the welfare consequences of engagement in either type of commercial agriculture examined- higher value crops like tobacco or technologically more advanced food crops like hybrid maize. However, we see that females face a significantly lower chance to be engaged in commercial agriculture and slightly slower chance to receive access to productivity enhancing interventions.

The statistical analysis confirms the significant positive impact of female engagement in commercial agriculture on the household's chance to escape extreme poverty. Furthermore, our empirical analysis confirms that greater access to credit and fertilizer and seed coupons for women enhances their probability of entering the more profitable food production niches. However, we do not see any indication that they enhance their chance of entering higher value cash crop niches of the agricultural market, such as tobacco, which have historically been considered a "male" domain.

Indeed, when we perform the same rigorous regression analysis on the male sample (results available upon request), we see that greater availability of coupons and credit for males in the cluster enhances significantly their chance of entering the tobacco sector. Male entry into the tobacco sector, in turn, has stronger positive welfare implications on poor households than female entry into the tobacco sector.

Overall, our conclusions echo the message of related research (Udry, 1996; Udry and Goldstein, 2008; von Braun, Puetz and Webb, 1989), and indicate that gender norms in cash crop production and the availability of complementary production resources – including, among others, land and appropriate networks- should be properly understood for female empowerment interventions of the types implemented in Malawi to have the desired empowering and poverty alleviating effect.

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**Figure 1: Commercial agricultural engagement and the probability of being ultra poor**

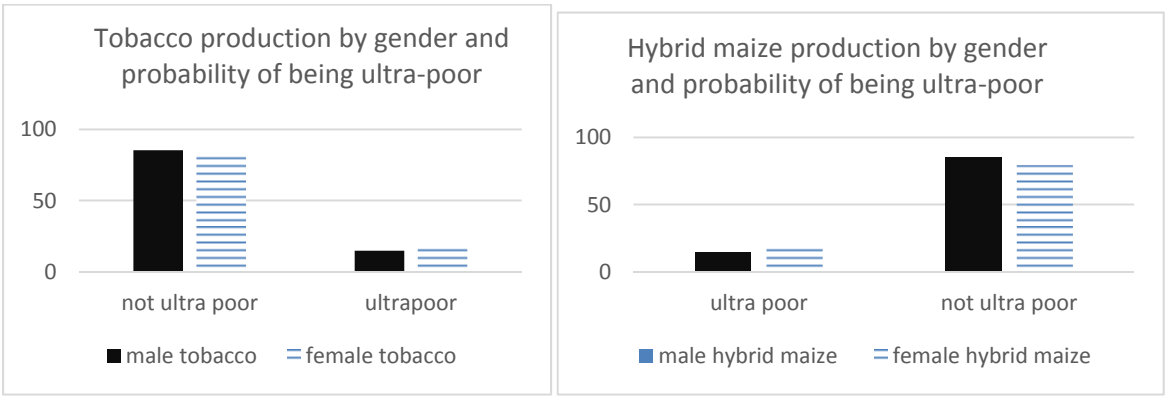


**Figure 2: Commercial agricultural engagement by gender**

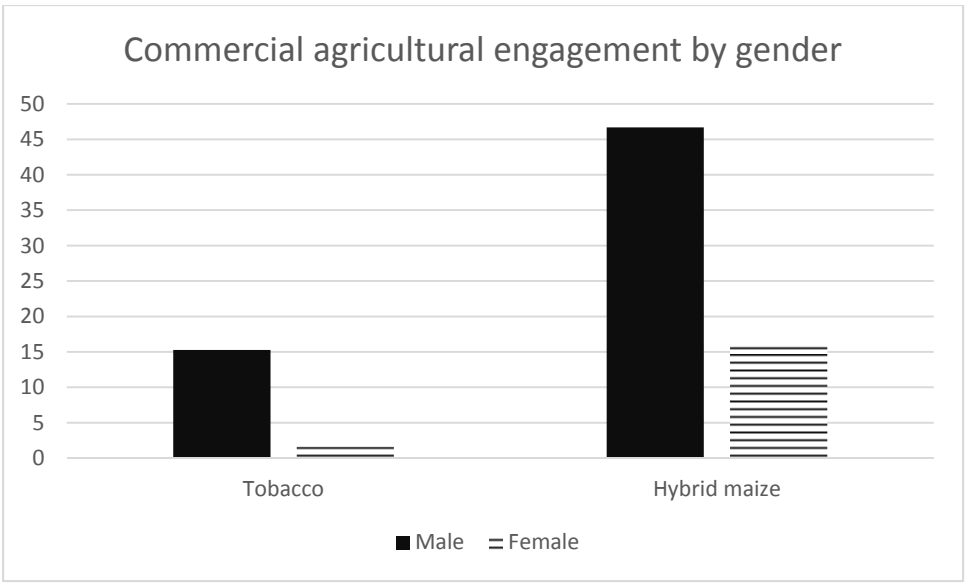

**Figure 3: Gender differences in the receipt of coupons and credit**

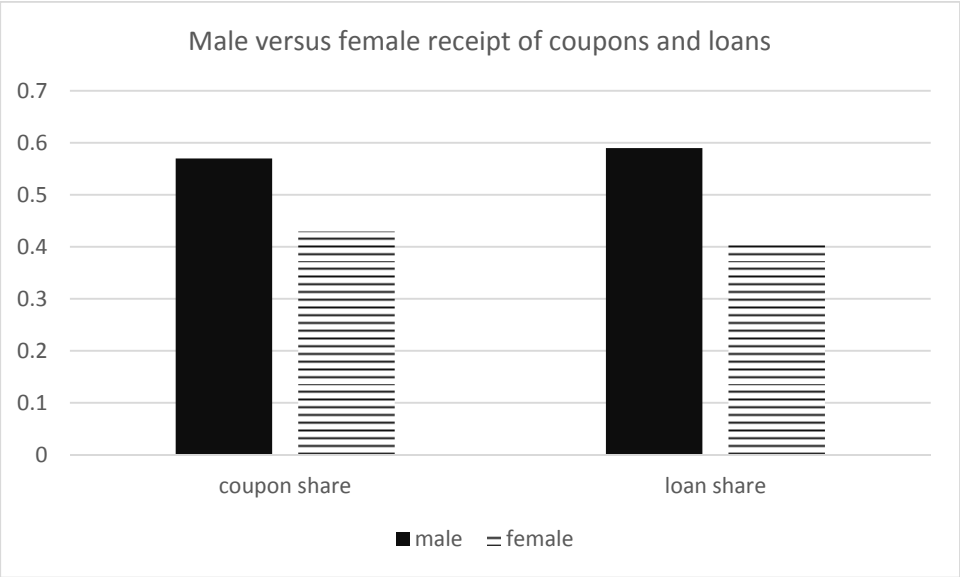


**Figure 4: Impact of female engagement in commercial agriculture on poverty and extreme poverty**

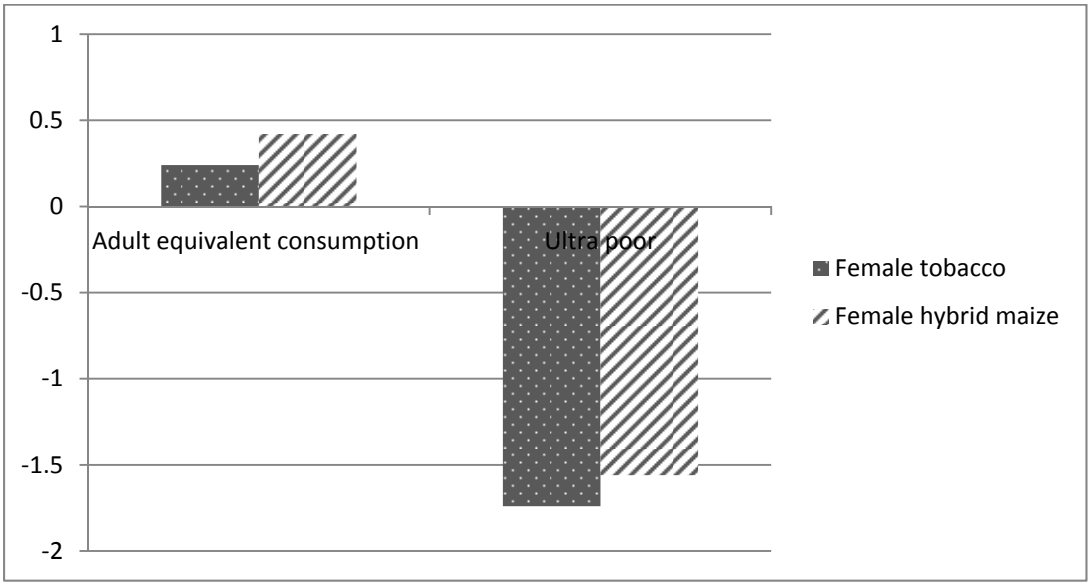

**Table 1: Direction of impact of policy interventions on female agricultural commercialisation**

| | **Female high value crops** | **Female hybrid maize** |
|---|---|---|
| Female land size | Positive | Positive |
| Male land size | Negative | Negative |
| Extension services | Positive | Positive |
| Village level access to finance | Insignificant | Positive |
| Female share coupons | Negative | Positive |
| Female share loans | Insignificant | Positive |

## Appendix

### A1. Brief description of the empirical methodology

Heuristically, we model household welfare as being dependent on female engagement in commercial agriculture, where female engagement in commercial agriculture is, in turn, a result of a set of government policies, such as access to credit, extension services and other inputs in the production process, and household endowments including land and human capital. In other words, we estimate the following system of equations:

$$Welfare = X_C\beta_C + \delta_C FemaleCommercial + \varepsilon_C, \quad [1]$$

$$FemaleCommercial^* = Z_{HV}\theta_{HV} + \mu_{HV} \quad [2]$$

In equation [1] we successively proxy *Welfare* with a range of stylized welfare measures for the $i^{th}$ household including per adult equivalent food consumption and child anthropometric characteristics, $X_C$ are a set of *j* variables, $\beta_C$ is the associated vector of coefficients, and $\delta_C$ captures the effect of female engagement in commercial agriculture. The residual $\varepsilon_C$ is assumed to follow normal distribution $\varepsilon_C \sim N(0,\sigma^2)$. In equation [2] $FemaleCommercial^*$ is a latent variable measuring the likelihood of female engagement in commercial agriculture, $Z_{HV}$ is a vector of explanatory variables, $\theta_{HV}$ is the associated vector of coefficient estimates and $\mu_{HV}$ is the error term. The latent variable $FemaleCommercial^*$ is unobserved, but we observe $FemaleCommercial = 1$ when $FemaleCommercial^* > 0$ and $FemaleCommercial = 0$ otherwise. Under the assumption that $\mu_{HV}$ 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 $\Phi(.)$ is a normal distribution function. As argued in the main body of the chapter, we estimate the related model where ultrapoor is a dependent variable as a Biprobit model, which is the conceptually analogical equivalent of the treatreg model for the case of limited dependent variable.

## Table 1A: Empirical results

| | Food_adulteq | | Food_adulteq | | Ultrapoor | | Ultrapoor | |
|---|---|---|---|---|---|---|---|---|
| **Constant** | 10.76*** | -3.00*** | 10.73*** | -2.10*** | -1.48*** | -3.10*** | -1.21*** | -2.12*** |
| | (0.04) | (0.22) | (0.03) | (0.11) | (0.09) | (0.21) | (0.08) | (0.11) |
| **Head age** | -0.00*** | -0.00 | -0.00** | -0.00** | -0.00*** | -0.00 | -0.00*** | -0.00** |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| **Female head** | -0.13*** | 1.26*** | -0.31*** | 1.67*** | 0.37*** | 1.23*** | 1.04*** | 1.68*** |
| | (0.03) | (0.13) | (0.05) | (0.07) | (0.07) | (0.13) | (0.08) | (0.07) |
| **Married monogamous** | -0.03 | 0.23*** | -0.00 | -0.10 | 0.02 | 0.24* | -0.12* | -0.10 |
| | (.03) | (0.13) | (0.03) | (0.08) | (0.07) | (0.13) | (0.06) | (0.07) |
| **Married polygamous** | -0.04 | 0.58*** | -0.03 | 0.26*** | 0.08 | 0.52*** | 0.00 | 0.22** |
| | (0.03) | (0.15) | (0.03) | (0.09) | (0.08) | (0.15) | (0.07) | (0.09) |
| **Household size** | -0.10*** | 0.04** | -0.10*** | 0.04*** | 0.18*** | 0.03* | 0.17*** | 0.04*** |
| | (0.00) | (0.02) | (0.00) | (0.00) | (0.01) | (0.02) | (0.01) | (0.01) |
| **Primary education** | 0.23*** | 0.13 | 0.22*** | 0.12* | -0.49*** | 0.12 | -0.40*** | 0.08 |
| | (0.02) | (0.14) | (0.02) | (0.07) | (0.06) | (0.13) | (0.05) | (0.07) |
| **Secondary education** | 0.39*** | 0.08 | 0.37*** | 0.31*** | -0.77*** | 0.05 | -0.58*** | 0.26*** |
| | (0.02) | (0.14) | (0.02) | (0.06) | (0.06) | (0.14) | (0.06) | (0.06) |
| **Tertiary education** | 0.98*** | 0.44* | 0.94*** | 0.51*** | -1.74*** | 0.37 | -1.29*** | 0.49*** |
| | (0.05) | (0.27) | (0.05) | (0.14) | (0.33) | (0.27) | (0.28) | (0.14) |
| **Female land size** | | 0.22*** | | 0.08*** | | 0.21*** | | 0.08*** |
| | | (0.02) | | (0.02) | | (0.02) | | (0.01) |
| **Male land size** | | -0.08** | | -0.18*** | | -0.05 | | -0.12*** |
| | | (0.03) | | (0.03) | | (0.03) | | (0.02) |
| **Extension services** | | 0.30** | | 0.33*** | | 0.39*** | | 0.37*** |
| | | (0.12) | | (0.06) | | (0.11) | | (0.06) |
| **Access to finance** | | -0.10 | | 0.16*** | | 0.06 | | 0.23*** |
| | | (0.14) | | (0.06) | | (0.14) | | (0.05) |
| **Female share coupons** | | -0.70*** | | 0.45*** | | -0.47*** | | 0.47*** |
| | | (0.16) | | (0.07) | | (0.16) | | (0.06) |
| **Female share loans** | | -0.07 | | 0.21*** | | -0.00 | | 0.19*** |
| | | (0.11) | | (0.05) | | (0.10) | | (0.04) |
| **Female tobacco** | 0.24** | | | | -1.74*** | | | |
| | (0.09) | | | | (0.21) | | | |
| **Female hybrid maize** | | | 0.42*** | | | | -1.56*** | |
| | | | (0.08) | | | | (0.07) | |
| **N Observations** | 9025 | | 9025 | | 9025 | | 9025 | |

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