The negative impact of farm input subsidies on women's agency in Malawi's matrilocal settlements

by Martin Limbikani Mwale, Dieter von Fintel, Francesca Marchetta, Anja Smith, and Tony Mwenda Kamninga

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Abstract

While women constitute a majority of Africa's agricultural labour force, only a minority of them make decisions about income earned from harvests. Poor command over production capital – including unenforced individual rights over cultivated land and poor access to inputs such as fertiliser – is one constraint that limits women's agency over income from agricultural outputs. This paper studies Malawi's Farm Input Subsidy Programme (FISP) that distributed fertiliser and seed vouchers to poor agricultural households in a context of high gender inequality, a dominantly matrilineal land inheritance system and dual matrilocal and patrilocal settlement practices after marriage. Because the FISP alters households' agricultural input combinations, de facto gender-specific land rights in matrilocal and patrilocal communities should play a smaller role in determining who has decision-making power in households. This paper estimates the heterogeneous impacts of subsidies on gendered agency patterns in matrilocal and patrilocal communities. Women have a low degree of agency in all communities, though the disadvantage is highest in patrilocal communities. Econometric models show that men have less agency in matrilocal communities than in patrilocal communities, but the FISP narrows this gap. Male household heads in matrilocal communities experience less competition from male members of their wives' extended families when they receive the FISP. The programme therefore increases gender inequality in matrilocal decision-making to more closely resemble the pattern in male-dominated patrilocal communities. Nevertheless, women in patrilocal regions are able to leverage the returns from increased market integration to reduce their involvement in precarious *ganyu* labour. Targeting women as beneficiaries of the FISP is unlikely to change agency patterns in especially matrilocal communities unless women's individual rights over cultivated land are also asserted.

JEL codes: G38; O13; O20; Q18

Keywords: Female bargaining power, Farm input subsidies, Matrilocality, Malawi

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1 Introduction

Despite the fact that women constitute over 50% of the agricultural labour force in Africa, only a minority of them make decisions about income earned from harvests and other sources (Annan et al., 2019; Ali et al., 2016; Geisler, 1993; Quisumbing et al., 1995). One reason why women have limited bargaining power over income from agricultural outputs is their poor access to production capital (Shibata et al., 2020). Women rarely have well-defined individual property rights over cultivated land, and they are often excluded from credit for acquiring inputs (Yngstrom, 2002; Asiedu et al., 2013). These factors have proven to be a binding constraint to women's agency (Akinola, 2018).[1] Extending land rights is crucial to increasing women's agency (Agarwal, 2003). Increasing women's access to other farm inputs is likely to be another way to do so, and farm input subsidies can help to achieve this.

Farm input subsidies have regained traction in sub-Saharan Africa's policy space (Jayne et al., 2018) and could contribute to changing the balance of power within households. Changing command over inputs could alter the pattern of control over outputs. Therefore, the distribution of input subsidies could affect women's bargaining power. Input subsidies introduce a new form of capital to farming households. Usually, contextual factors – such as gendered inheritance practices or local marriage and residence systems – determine how gendered patterns of control over capital alter the impact of policies in sub-Saharan Africa (Berge et al., 2014). Household heads are the target recipients of the subsidies. They are usually men regardless of whether land rights are allocated along the matrilineal or patrilineal line or settlement patterns are patrilocal or matrilocal. *De facto* local customs around land rights have different implications for the rights of use of farm inputs. This paper explores this possibility.

We aim to address the following research questions: (i) Do input subsidies have an impact on who is the main decision-maker over income from agricultural outputs? (ii) Does this impact differ according to prevailing post-marriage land-settlement practices in the communities where couples live?

We explore these issues in the context of Malawi. Despite the prevalence of a matrilineal inheritance system whereby land rights are passed on through women,[2] Malawi has a dual post-marital settlement practice system that arose during missionary expansion in the country (Berge et al., 2014; Mtika and Doctor, 2002). Some couples follow patrilocal traditions and therefore move to the husbands' communities after marriage. Others are matrilocal and move to the wives' communities. The country pioneered the introduction of a large-scale targeted farm input subsidy programme (the Farm Input Subsidy Programme or FISP) with the aim of increasing cereal yields and improving the livelihood of rural households (Chibwana and Fisher, 2011). Malawi also has one of the highest rates of gender inequality in sub-Saharan Africa (UNDP, 2019; Torres, 2019). These three attributes make the country an interesting case study to examine changes in women's agency in response to input subsidies and understand

[1] For our purposes, agency is defined as autonomy in deciding how income from selling maize is spent (Kagotho and Vaughn, 2018).

[2] It is estimated that 75% of the Malawian population is matrilineal (Behrman, 2017).

the role of gender-based land-settlement practices in facilitating or limiting the impact thereof on women.

We use the 2010 and 2013 waves of Malawi's Integrated Household Panel Survey (IHPS). We first study the effect of receiving FISP vouchers on the probability that households sell maize, the quantity of maize sold and the monetary value of sales. We then split the sample by gender and examine the effect the FISP has on decision-making about income from maize cultivation for both men and women in the same household. We also study changes in their participation in casual *ganyu* labour.[3] We use linear probability models (LPMs) with fixed effects to model binary outcomes such as participation in maize sales or *ganyu*, and decision making. We use Tobit correlated random effects models when outcomes are continuous and censored, such as the quantity and value of maize sold. We control for time-invariant heterogeneity but not for time-variant unobservables. However, we follow the literature, which suggests that the main unobservable factors that determine selection into the FISP (i.e., relationship to the village leaders and social connections) are stable over short periods of time (Ricker-Gilbert, 2014). We also include many time-variant labour supply determinants in our specifications.

The FISP has heterogeneous impacts relative to the land settlement context. We find that the FISP increases maize market participation only in patrilocal communities. It has no impact on agency over outputs in patrilocal communities, where men had predominantly secure land rights even before receiving input subsidies (Berge et al., 2014). Even if women in patrilocal communities do not gain agency, they do less precarious *ganyu* due to the extra income from the FISP. Gendered changes in agency are unrelated to changes in productivity. Rather, gendered patterns in agency continue to follow local customs.

Impacts are different in matrilocal communities. The FISP does not improve maize market participation in matrilocal communities; it does not provide any extra liquidity to allow matrilocal women to let go of *ganyu*. However, women living in matrilocal communities lose decision-making power over earnings when their households receive the FISP. As was the case in patrilocal communities, this does not depend on having surplus production for sale. Instead, local customs and changes in inputs must explain the changes. We argue that women lose agency because men in matrilocal regions gain control over a new resource that compensates for their relatively poor land rights and therefore increases their own agency *vis-à-vis* that of women. Male household heads in matrilocal communities have less command over land than their counterparts in patrilocal communities; decisions are often made by men in their wives' extended families (uncles and brothers-in-law), and not by the male household heads or their wives (Phiri, 1983). The FISP therefore changes the input mix in nuclear households because it is distributed to male household heads (Djurfeldt et al., 2018) rather than male extended family members. As a result, men in these communities improve their bargaining position to centralise decision-making in the nuclear family: they remove control from their wives' families. We hypothesise that this increase in men's bargaining power and agency leads to a reduction in women's agency.

[3] *Ganyu* is casual wage-paid or in-kind work on farms not belonging to the household (Bryceson, 2006).

Our findings contribute to two strands of literature. First, we contribute to the literature on the effects of farm input subsidies. The FISP increases access to fertiliser and hybrid seeds for cereals by providing vouchers to the heads of selected beneficiary households to purchase inputs at below-market cost (Ricker-Gilbert, 2014; Dorward and Chirwa, 2011). The prevailing literature has established that beneficiaries increase yields and are more likely to sell cereals at the market (Sibande et al., 2017; Chibwana et al., 2012). The resulting increased liquidity allows households to reduce their participation in precarious casual labour (Ricker-Gilbert, 2014). We establish that the positive productivity effects are confined to patrilocal communities. The reduction in casual labour occurs only for women living in patrilocal communities without changing their agency.[4] More importantly, we add that these agricultural strategies *reduce* women's agency in matrilocal communities without increases in productivity. Prevailing post-marital residence practices are not neutral with respect to the effect of farm input subsidies on labour market outcomes and intra-household decision-making.

Second, we add to the literature on household bargaining and kinship practices. In all the communities we study, inheritance practices are *matrilineal* in nature: households are allocated land inheritances by their *maternal* uncles (or *mwinimbumba*, the head of the clan) (Shwachman Kaminaga, 2020; Hatcher et al., 2005; Phiri, 1983). What varies between communities is the post-marriage settlement practices. In patrilocal communities, men stay on the land they inherit through the matrilineal line and their wives relocate to their homes. In matrilocal communities, women stay on their inherited land and their husbands relocate to their homes. These land rights mean that men in patrilocal communities have a high level of bargaining power in their nuclear households, with no competition from their wives' extended families. In matrilocal communities, male household heads share their bargaining power over land inputs in part with their wives but mainly with their wives' extended families from whom the land was inherited. Regardless of the matrilineal inheritance system and patrilocal/matrilocal settlement practices, relationships within households are mainly patriarchal in nature (Djurfeldt et al., 2018). Still, matrilocal men have low baseline autonomy relative to their patrilocal counterparts as they do not own the land (Mtika and Doctor, 2002). We show that gaining control of agricultural inputs – those allocated not by the inheritance or marriage system but through the FISP – allows men in matrilocal households to partly "emancipate" themselves from the decisions of the men in their wives' extended families (Mtika and Doctor, 2002). The FISP changes the internal balance of power in matrilocal communities to more closely resemble the pattern seen in households in patrilocal communities: men have more decision-making power in their nuclear households and face less competition from their wives' extended families (Walther, 2017). Given that only one person in a household can be the *main* decision-maker, our conceptualisation of power in the household means that one party's gains result in losses for the other party. The FISP therefore has no positive consequences for women's agency, and in ma-

[4] Ricker-Gilbert et al. (2013) found similar results without distinguishing by gender or settlement pattern. We replicated the aggregated results with our sample and also found that casual labour is reduced in response to the FISP. Our results explore the heterogeneity of these original findings by gender and locality.

trilocal communities, subsidies go as far as reducing women's bargaining power relative to that of men.

Finally, our paper contributes to the debate around the transition from the FISP to the Affordable Inputs Programme (AIP). Since 2020, the AIP targets *all* smallholder farmers, including those who are wealthier. With a broader target group, the AIP can potentially increase the number of surplus producers in matrilocal communities. The unintended gender consequences can therefore be more widespread under the AIP than under the FISP in this context. The rest of the paper is structured as follows. Section 2 describes the study context. Section 3 presents the data and the methodology. Section 4 illustrates the main results, and finally, Section 5 concludes the paper.

2 Study Context

2.1 Background

Malawi is a landlocked country in southern Africa that is covered mostly by water (NSO, 2019) and in which agriculture contributes to 39% of GDP and employs 85% of the labour force (Chinsinga and Chasukwa, 2018). Malawian agriculture is predominantly rain-fed, with irrigated farms taking up only about 16% to 20% of total arable land (FAO, 2015). Most farming in Malawi is practised by subsistence farmers on small pieces of land.

Malawi has high levels of gender inequality. It ranks high on the UN's Global Gender Inequality Index and fares poorly in "gender equality in life" outcomes (literacy, income, labour market participation), legislation and other social practices (UNDP, 2019; Torres, 2019). The situation is worse in rural areas, where men and women assume traditional gender roles and inequality in access to land arises from post-marriage settlement arrangements (Djurfeldt et al., 2018). The country therefore provides a compelling case to understand whether post-marital land settlement practices determine the nature of the impact of input subsidy programmes on decision-making and casual labour participation by gender.

2.2 The Farm Input Subsidy Programme

The Government of Malawi (GoM) established the FISP in 2006 against a backdrop of long-standing severe food insecurity that persistently affected the country from the late 1980s until 2005 (Asfaw et al., 2017; World Bank, 2004). The programme's primary objective was to increase the income of subsistence farmers through sustained food security (Dorward and Chirwa, 2011; Chibwana et al., 2012). A predecessor to FISP that had similar goals was abolished in the late 1980s in compliance with the Structural Adjustment Programmes (SAPs). The SAPs perceived large-scale universal subsidies as unsustainable, and the predecessor programme's subsidies were thought to introduce distortions into commercial input markets (IMF, 2008).

Prior to 2006, subsidies were granted to all farmers. From 2006 to 2019, the subsidy programme targeted resource-poor farmers who had land to cultivate but were unable to obtain inputs at market prices (Lunduka et al., 2013; Sibande et al., 2017; Dorward and Chirwa, 2013; GoM, 2019). A typical FISP beneficiary package comprised four vouchers. Two were used to purchase fertiliser (basal and top dressing) and the other two were used to purchase seed (maize and legume). Only the household heads in the selected households are entitled to receive the vouchers (Chibwana et al., 2012; Karamba and Winters, 2015; Chirwa et al., 2011).

From the programme's inception in 2006 until 2008, the GoM allocated vouchers to districts in proportion to the amount of land being used for maize cultivation (Sibande et al., 2017; Karamba and Winters, 2015; Dorward and Chirwa, 2013). A large number of vouchers were distributed in the central region, as it has the highest number of farms in the country. The initial objective was to attain efficiency by targeting resource-poor farmers who were productive. After the 2008 growing season, the GoM shifted the programme's focus from production efficiency to

social protection. In this second phase, the programme targeted vulnerable beneficiaries, including child-headed households, female-headed households, and households caring for the HIV/AIDS infected or the elderly (Lunduka et al., 2013). The new focus increased the number of beneficiaries in the southern region of the country, which is densely populated and has more vulnerable households than the central and northern regions (NSO, 2014).

Irrespective of the changes to the programme's implementation modalities, there is consensus that the programme met the objective of increasing subsistence farmers' cereal productivity (Chibwana et al., 2012; Dorward and Chirwa, 2013; Karamba and Winters, 2015). Beneficiary farmers increased yields and market participation to obtain income from harvests (Sibande et al., 2017). The resulting improved liquidity position of these households has second-round effects. Harou (2018) shows that the FISP improved short-term child nutrition, while Ricker-Gilbert (2014) finds that households that were FISP beneficiaries participated less in casual labour. Considering that men and women doing casual labour face different working conditions – for instance, through the under-payment and sexual exploitation of women (Bryceson, 2006) – the FISP could have gender-asymmetric labour outcomes that have not yet been explored. Most likely, women move away from precarious *ganyu* labour once the FISP provides alternative means to generate income.

In 2020 the FISP was replaced by AIP, which was designed to reach *all* smallholder farmers. AIP however maintained the other objectives introduced by FISP. Insufficient time has passed to evaluate this change.

2.3 Inheritance and post-marital settlement practices

Post-marital land settlement practices (matrilocality and patrilocality) generate differential land rights for men and women (Berge et al., 2014). Even if the FISP is not allocated according to these customs, *de facto* practices could affect who has command over income from agricultural outputs and how it affects women's participation in *ganyu*. Land right priority is given to the individual who was born in the community – men have more rights than their wives in patrilocal regions, and women and their extended families have more rights than their husbands in matrilocal regions (Takane, 2008). Men and women therefore have different agency over their agricultural outputs depending on their locality.

Traditionally, Malawi had only a matrilineal inheritance system with only matrilocal settlement practices.[5] That is, men move into women's communities after marriage and produce and invest on the women's familial land (Mtika and Doctor, 2002). Women are given rights to use the land by their maternal uncles. Uncles retain overall control over who may farm the land and investments made on the land (Walther, 2018). When marriages dissolve, matrilocal women, together with their maternal uncles, keep the household assets and custody of the children, while the husband returns to his natal village empty-handed (Place and Otsuka, 2001). Hence, they use divorce as a bargaining chip to negotiate better treatment from their husbands (Walther,

[5]Within the minority patrilineal inheritance system, only patrilocal settlement arrangements are practised.

2017).

However, with exposure to missionaries, colonial tax payment arrangements, patrilineal tribes and the slave trade, some matrilineal tribes have adopted patrilocal post-marital settlement arrangements while retaining matrilineal inheritance practices (Mtika and Doctor, 2002; Phiri, 1983). With the rise of patrilocality, men started to take wives into their villages rather than the other way around. Men obtain land rights from their *maternal* uncles. In contrast to matrilocal communities, where maternal uncles retain ultimate authority over the allocation of land rights, in patrilocal communities, men obtain land rights themselves (Mtika and Doctor, 2002; Walther, 2017; Hatcher et al., 2005). They are therefore in a relatively powerful position to make decisions about cultivation and income from their harvests. When marriages dissolve in these communities, women have no rights to the investments made in the land, while men retain control of the land rights and improvements to the agricultural land. Women retain only custody over the children, with whom they move back to their natal villages (Hatcher et al., 2005). With this undesirable outside option, patrilocal women often bargain for fair treatment through labour rationing (Walther, 2017).

2.4 The FISP, gender and post-marriage locality

The FISP provides fertiliser and seed vouchers to household heads, who are dominantly men (Djurfeldt et al., 2018). Despite the country being a matrilineal society, patriarchal values still determine headship. Furthermore, men's incentives to invest in the land differ depending on the prevailing settlement practice (Place and Otsuka, 2001) and could determine who derives benefit from the FISP.

Even when FISP benefits are accessible to the spouses of patrilocal men, they are limited to within the nuclear family. This is because wives in patrilocal communities live away from their extended family, who could otherwise have taken control of agricultural earnings based on the women's uncles' continued right to control land allocation (Berge et al., 2014). On the other hand, the FISP gives matrilocal male household heads an input that cannot be controlled by their wives' extended families, and they can therefore bargain to use it for their own benefit. Men's use of FISP benefits for bargaining is likely to increase their own agency and bargaining power relative to that of their wives' *uncles*. In fact, their control over the FISP vouchers increases their bargaining power relative to that of their wives.

Women are unlikely to make decisions about how FISP benefits are used, regardless of their locality. The fact that FISP vouchers go mainly to male household heads (Djurfeldt et al., 2018) coupled with patriarchal intra-household relations means that competition arises between the husbands and the men in the extended matrilocal families, rather than the bargaining power of men and women changing *within* their own households. In patrilocal communities, this tension would be minimal; however, in matrilocal communities, men are incentivised to use their FISP rights to counterbalance the rights that their wives' families have over the land.

Instead of changing the balance of female non-labour input capital, the FISP is likely to affect women's bargaining power through their labour supply. Higher earnings from subsidised

crops could reduce their supply of *ganyu* labour.

It is against this complex backdrop that this paper uses Malawi as a case study to understand the effects of farm input subsidies on women's agency and participation in casual labour subject to the prevailing post-marital land settlement practice. The impact on women's agency has to be understood relative to the changes the FISP triggers in their husbands' agency.

3 Methodology and Data

3.1 Econometric specifications

Our econometric models focus on three main outcomes: household maize sales, individual decision-making about income from maize cultivation and individual participation in casual *ganyu*. In the case of maize sales, households are our primary unit of analysis. Our equation of interest is:

$$y_{jcrt} = \beta_1 FISP_{jcrt} + \beta_2 matri_c + \beta_3 FISP_{jcrt} \times matri_c + \boldsymbol{\lambda}' \boldsymbol{x}_{jcrt} + \boldsymbol{\delta}' \boldsymbol{c}_{crt} + \gamma_r + \kappa_t + \mu_j + \varepsilon_{jcrt} \quad (3.1)$$

where y is the outcome for household j in community c in region r at time t. We differentiate these effects by locality. The programme's effect on household outcomes in patrilocal communities is estimated by β_1, while its effect in matrilocal communities is $\beta_1 + \beta_3$. The vector $\boldsymbol{x}$ contains household characteristics (including the age and squared age of the household head, whether the head of the household is chronically ill, real annual per capita household consumption, the number of adult equivalents and the size of landholdings). The vector $\boldsymbol{c}$ contains community characteristics (including the local *ganyu* wage rate, distance to the nearest road, distance to the nearest trading centre (also known as a British Oversees Military Administration or BOMA), distance to the nearest border post and annual average rainfall). The variable γ_r represents climatic zone fixed effects, while κ_t contains year fixed effects. Because we have household panel data, we include time-invariant household fixed effects (μ_j).[6]

We analyse all individual-level outcomes separately by gender (decision-making and participation in *ganyu*). We expect household heads (the targeted FISP recipient in households), their spouses and extended families to negotiate for decision-making power over agricultural inputs and outputs. We limit our study to a sample of couples, of which one member is the head of the household. That is, we start with a sample of household heads and their spouses, and then run specifications on a sample of men separately from a sample of women to whom they are married. Our objective is to understand changes in who the main decision-maker is within each couple. We therefore estimate the heterogeneous impacts of the FISP on men and women based on their post-marriage settlement decisions. Our equation of interest changes to include individuals as a unit of analysis:

$$y_{ijcrt} = \beta_1 FISP_{jcrt} + \beta_2 matri_c + \beta_3 FISP_{jcrt} \times matri_c + \boldsymbol{\gamma}' \boldsymbol{z}_{ijcrt} + \boldsymbol{\lambda}' \boldsymbol{x}_{jcrt} + \boldsymbol{\delta}' \boldsymbol{c}_{crt} + \gamma_r + \kappa_t + \mu_i + \varepsilon_{ijcrt} \quad (3.2)$$

Now i indexes individuals, $\boldsymbol{z}$ is a vector of individual-level controls (including age and education), and μ_i is a person-specific fixed effect.

[6] The definitions of all the variables used in the analysis can be found in Table B.2 of Appendix B.

3.2 Functional form and identification

We use two types of dependent variables. The first is a set of binary variables that denote participation in *ganyu*, going to the market to sell maize and decision-making about the income from selling maize. We estimate these models using LPMs with fixed effects.

The second type of dependent variables is continuous but censored at zero because of non-participation. These variables include the quantity of maize sold at the market and the monetary value of sales. We therefore use the Tobit correlated random effects model to account for censoring and add the means of all the control variables to remove unobservable heterogeneity and solve the "incidental parameters" problem (Mundlak, 1978; Chamberlain, 1984; Wooldridge, 2019).

While our models control for only time-invariant heterogeneity, we argue that the most influential unobservable variables are persistent over short periods. Previous studies highlight the following unobservable factors that determine selection into the FISP: households' relationship to village leaders (Pan and Christiaensen, 2012) and their social connections (Jayne et al., 2018). Furthermore, farming ability, risk aversion and motivation contribute to programme participation (Ricker-Gilbert, 2014). We argue that these attributes do not vary significantly over time and identify impacts with fixed effects or the Mundlak (1978) device. Furthermore, we include many other time-variant labour supply determinants in our specifications ($\boldsymbol{z}_{ijcrt}$; $\boldsymbol{x}_{jcrt}$ and $\boldsymbol{c}_{crt}$).

In addition to the fixed effects specification, we re-weight all models using inverse propensity scores. We estimate a logit model of FISP participation (see Table A.1). The covariates that determine FISP participation were derived from the GoM's guidelines for identifying beneficiaries (we provide a full description for every choice variable in Appendix A). We use a logit model to generate propensity scores ($p_{i,j,c,r,t}$). We weight each observation of the treatment group by 1 and each one of the control group by $\frac{1}{1-p_{i,j,c,r,t}}$ (For more details, see Hirano and Imbens (2001)). Figure A.1 of Appendix A shows that the re-weighted control group has a similar propensity score distribution as the treatment group, which reduces bias on observable attributes.

Finally, we cluster all standard errors at the community level to reflect that FISP administration is decentralised among village leaders and that matrilocality and patrilocality are defined by this geographic level.

3.3 Malawi's Integrated Household Panel Survey

This study uses Malawi's IHPS to understand how post-marital settlement arrangements mediate the relationship between farm input subsidies and women's agency and participation in casual labour. Malawi is one of eight sub-Saharan countries that conduct a series of Living Standards Measurement Survey - Integrated Surveys on Agriculture (LSMS-ISA). The IHPS falls into this ambit and includes questions about the FISP.

The IHPS was conducted by the Malawi National Statistical Office (NSO) with technical support from the World Bank. The survey used the 2008 Malawi Population and Housing Census as a sampling frame. It is nationally representative and currently consists of four longitudi-

nal waves, conducted in 2010, 2013, 2016 and 2019. However, by 2016, the panel contained many split households, which complicates tracking individuals. Households potentially split for reasons endogenous to the FISP – such as losing the subsidy – and this would compromise our estimates. Furthermore, the 2016 Land Act allowed many smallholders to obtain title, so our premise that land and agricultural inputs determine decision-making power could be confounded by the policy change. We therefore use only the 2010 and 2013 waves of data.

The IHPS was created by following 3,246 households from 32 districts and 204 enumeration areas from the third Integrated Household Survey cross-section that was conducted in 2010. The 2013 wave successfully revisited and tracked a total of 3,104 households. Twenty baseline household heads passed away, and the remaining 123 (3.78%) households attrited (Harou et al., 2017; Sibande et al., 2017). We exclude non-agricultural households and households with incomplete information from the analysis. Moreover, we limit our sample to male-headed households. Dzanku (2018) shows that female-headed households in Malawi do not respond to own-farm agricultural policy interventions.[7] Furthermore, most female household heads in our sample do not have spouses, which limits our understanding of the transfer of agency between men and women within households. We therefore do not analyse female-headed households any further. The final sample therefore comprises male household heads from 1,207 households and their spouses, who were observed over 2 years.

The survey asked respondents about the type of crops that their households produced in the most recent growing season, which allowed us to identify maize farmers. Follow-up questions asked respondents whether they sold maize at any time in the previous growing season, the total amount that was sold over the season, and the market value of these sales. Respondents who sold maize at the market were asked to indicate who made the decisions about earnings from the sale of the maize. We created a dummy for each individual in each couple that equals 1 if (s)he made decisions over earnings and 0 otherwise.

The survey also asked community informants about the marriage custom that is most commonly practised by the majority of households in the area. The responses included matrilineal matrilocality, matrilineal patrilocality, patrilineal patrilocality and neo-locality (where spouses stay in a neutral community that is not linked to the families of either partner).[8] We use this question to create a dummy variable for matrilocality where 1 represents matrilineal matrilocality and zero is matrilineal patrilocality. Other localities are excluded from our main analysis but included in robustness checks. This is because the sample contains very few patrilineal patrilocal households (31 out of 303 communities) and neo-local households (52 out of 303 communities). Further, this exclusion enabled us to isolate the effects of locality from those of lineage. We also limit our analysis to households that were sampled in the same agricultural season across the two waves of the panel. This is to avoid following seasonal "switchers" across years. For example, consider a household that reports selling at the market in the prior season in the first wave but not the second one. This household could either be a "real" switcher over the

[7] Descriptive statistics in Appendix D confirm this using our sample.

[8] There are no matrilocal communities in the patrilineal system.

long run or have been temporarily absent from the market in the off-season. However, it is not possible to distinguish between those possibilities. This limitation is particularly relevant for minimising measurement error that is especially problematic for the fixed effects identification strategy.

3.4 Descriptive statistics

Figure 1 maps the geographic distribution of matrilocal and patrilocal communities in our sample of matrilineal households. Patrilocal communities are concentrated in the north of the country. The southern part of the country, which is generally characterised by higher poverty, is dominated by matrilocal norms. Figure 2 shows that a majority of rural farming households are FISP beneficiaries (regardless of region). However, the south has the highest coverage, with about 60% of households covered by the programme. These figures therefore confirm that the FISP primarily targeted poor households and reached the most impoverished regions. They were drawn into the programme after the change in emphasis towards social protection. On the other hand, matrilocal households tend to have the highest participation rates in the programme, especially in the south. Poverty, matrilocality and FISP receipt therefore intersect strongly to represent the most vulnerable households in the country.

Table 1 presents descriptive statistics of household participation in the market. Households in matrilocal communities are significantly less likely to go to market than households in patrilocal communities, sell on average about a quarter of the volume they do and derive about one third the income they do from selling maize. Low market integration in matrilocal farming communities emphasises their relative poverty. Table B.4 in Appendix B shows that matrilocal communities are more likely to face market exclusion, regardless of whether or not households are FISP beneficiaries. In fact, the matrilocal disadvantage is *larger* in FISP households: the programme seems to widen the gap between matrilocal and patrilocal communities. This suggests that the programme might have a greater impact on market integration in patrilocal regions (see Table B.3 in Appendix B).[9]

Although the programme targeted poor households and mainly reached matrilocal communities, Table 1 shows that the average FISP household is 11.1 percentage points more likely to participate in maize markets and sells more than double the output of unsubsidised households. While their income from selling maize is almost double that of non-FISP households, this difference is not statistically significant. These statistics support the well-established finding that the programme reverses poverty by prompting market integration (Sibande et al., 2017).

As noted earlier, FISP households are more integrated in the market in both patrilocal and matrilocal regions, but the differences between them and non-FISP households are larger in matrilocal regions. Table B.3 in Appendix B furthermore shows that FISP households cultivate larger plots, have lived in their communities for longer and receive more rainfall. At least some

[9]Furthermore, Table B.3 shows that matrilocal households have smaller plot sizes on average, receive less rainfall and pay more for fertiliser. However, they receive *higher* maize prices at the market and are closer to BOMAs, which were instrumental in distributing FISP vouchers.

of the advantages of the FISP we observe could therefore be ascribed to these selective characteristics of households. This supports our use of propensity score re-weighting and fixed effects estimation.

Table 2 explores differences in individual characteristics between men and women, but also distinguishes the differences by their communities' post-marriage settlement pattern and their FISP status. Men dominate decision-making about income they receive from selling maize, regardless of other characteristics. Table B.6 in Appendix B shows that gender differences in decision-making are large and strongly statistically significant. The gender difference is most pronounced in patrilocal non-FISP households and least pronounced in unsubsidised matrilocal households. Further, Table 2 confirms that women have significantly more decision-making power in matrilocal communities than in patrilocal communities. While post-marriage settlement customs have tangible consequences for gender equality, women remain at a large disadvantage in *all* communities.

Table B.5 in Appendix B breaks this pattern down by programme status. Women in *unsubsidised* matrilocal households are more likely to make decisions about income (albeit at a very low proportion of 11%) than women in patrilocal households. They are also more likely to make decisions than women in *subsidised* matrilocal households. As Table B.6 shows, women have less decision-making power in FISP households in these communities, while men have more. The programme is therefore likely to change the distribution of decision-making power in matrilocal communities to resemble the stronger gender inequality in patrilocal communities. In patrilocal communities, however, the gender gap in decision-making is smaller for FISP households. While Table 2 shows that the FISP is not associated with *overall* decision-making power within gender groups, the preceding discussion makes it clear that post-marriage settlement customs confound this result. There *are* heterogeneous gender associations.

If we turn to changes in participation in *ganyu* labour, Table 2 reveals no significant differences across local marriage customs. However, women are less involved in this precarious work when they live in *subsidised* households. No differences are observed for men, regardless of other characteristics. Again, these figures conceal heterogeneity. Considering locality and programme status simultaneously, Table B.5 in Appendix B shows that the difference is unique to women in patrilocal communities. Clearly, post-marriage settlement customs play a contextual role in determining the impact of the FISP on women's labour decisions.

Table B.5 in Appendix B further explores time use in response to the FISP. Generally, the FISP did not alter most time use patterns. Women in patrilocal FISP households spend fewer hours doing *ganyu* and more hours working on their own farms than women in patrilocal non-FISP households. Men in matrilocal FISP households spend more time working on their own farms than men in non-FISP households.[10] In addition, Table B.6 in Appendix B reveals that there are no gender differences in time spent working on one's own farm, but women spend more time collecting firewood and water compared to men.

Before we continue our main analysis of male-headed households, we briefly consider female-

[10] Econometric results in Table C show that these differences are insignificant with a full set of controls.

headed households, with descriptive statistics shown in Appendix D. There are no differences in market participation, decision-making or *ganyu* participation between FISP recipients and non-recipients or between patrilocal and matrilocal regions. This confirms that female-headed households are less responsive to food policy interventions Dzanku (2018). However, Table D.13 shows that there are gender differences in time use that are concentrated in matrilocal regions, particularly among FISP recipients.

Figure 1: The distribution of matrilocal and patrilocal marriage customs in Malawi

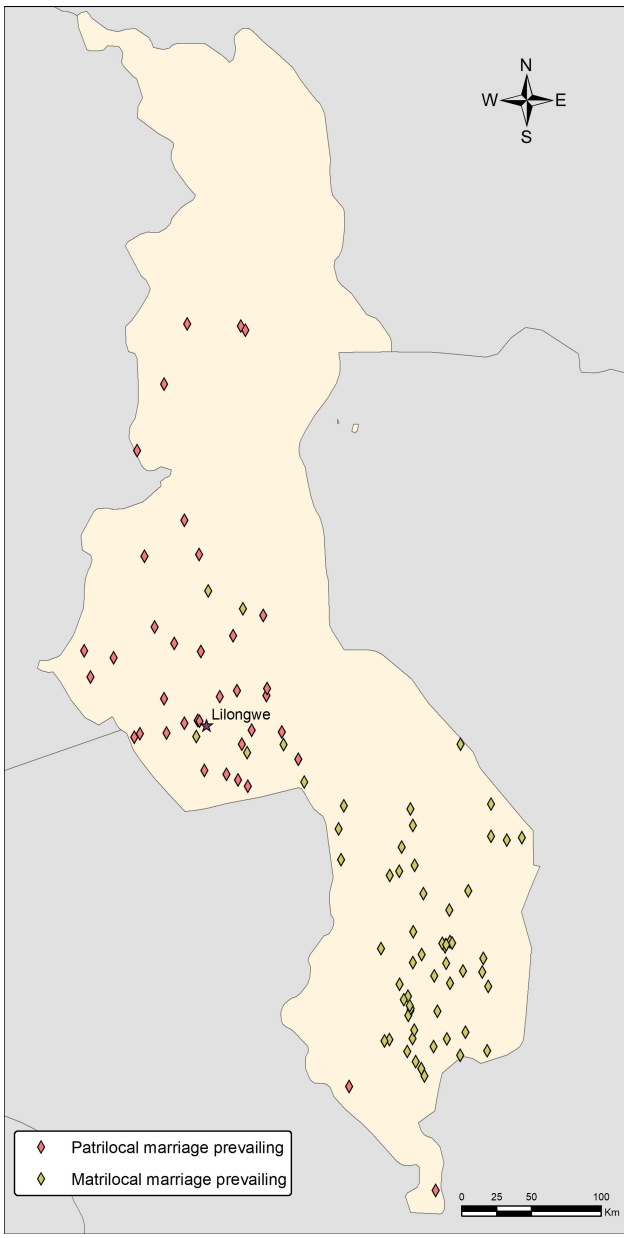

Figure 2: The distribution of FISP vouchers

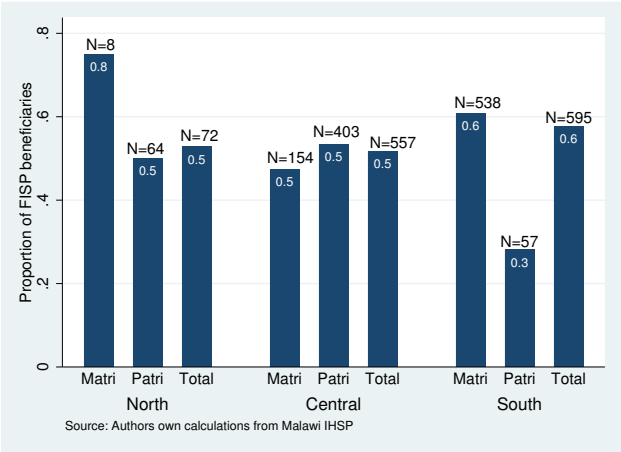

Table 1: Household differences in characteristics by marriage custom and FISP participation

	Matri	Patri	Diff	FISP	None	Diff
Sells maize (proportion)	0.430	0.615	-0.185***	0.559	0.449	0.110***
Output sold (kilograms)	19.421	74.351	-54.930***	57.661	25.189	32.471**
Value sold (MW-Kwacha)	1239.714	3847.672	-2607.957**	2953.117	1636.658	1316.459
Observations	700	524	1224	669	555	1224

Table 2: Individual differences in characteristics by marriage custom and FISP participation

	Women			Men		
	Matri	Patri	Diff	Matri	Patri	Diff
Decision on maize sale earnings usage	0.096	0.050	0.046*	0.894	0.919	-0.026
Ganyu (weekly participation)	0.060	0.090	-0.030	0.157	0.160	-0.003
Observations	700	524	1224	700	524	1224
	FISP	No FISP	Diff	FISP	No FISP	Diff
Decision on maize sale earnings usage	0.075	0.068	0.007	0.904	0.912	-0.008
Ganyu (weekly participation)	0.056	0.093	-0.038*	0.145	0.175	-0.030
Observations	666	558	1224	669	555	1224

4 Results and Discussion

4.1 Results

Table 3: The effects of the FISP on decision-making, maize sales and ganyu

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Households			Women	Men	Women	Men
	LPM	Tobit-RE		LPM			
	Seller	Quantity	Value	Decider	Decider	*Ganyu*	*Ganyu*
FISP	0.131***	0.512**	0.878**	-0.006	-0.089	-0.085**	0.037
	(0.046)	(0.248)	(0.439)	(0.048)	(0.057)	(0.041)	(0.062)
Matriloc	0.057	0.138	0.242	0.080	-0.158**	-0.112**	-0.006
	(0.049)	(0.299)	(0.525)	(0.067)	(0.075)	(0.052)	(0.059)
FISP × Matriloc	-0.132**	-0.481	-0.834	-0.135*	0.252***	0.087*	-0.000
	(0.059)	(0.334)	(0.593)	(0.081)	(0.091)	(0.052)	(0.073)
Constant	-5.210			14.184	-2.929	1.699	1.526
	(4.908)			(11.937)	(12.464)	(5.175)	(5.406)
Individual FE	Y	N	N	Y	Y	Y	Y
Mundlak controls	N	Y	Y	N	N	N	N
Region FE	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y
Other controls	Y	Y	Y	Y	Y	Y	Y
P: $\widehat{\beta}_F + \widehat{\beta}_{F\times M} = 0$	0.985	0.895	0.915	0.056	0.034	0.953	0.401
F	21.136			.	.	0.807	1.005
Observations	1207	1207	1207	616	615	1200	1207

NOTES: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Seller is a binary variable indicating whether households sold maize on the market, *Quantity* is the logged number of kilograms of maize sold on the market with zeroes replaced by 1, $Value$ is the logged earnings in Malawi Kwacha from maize sold on the market with zeroes replaced by 1, *Decider* is a binary variable indicating whether an individual makes decisions over incomes from selling maize on the market, *Ganyu* is a binary variable indicating whether an individual participated in casual work on another farm in the last week.

Standard errors are clustered by enumerator area and displayed in parentheses. The sample is limited to farming households in rural areas with matrlineal inheritance practices. Results that are distinguished by gender pertain to one part of the couple that heads the household and their spouse. Estimates are re-weighted using inverse propensity scores (see appendix A.1). Control variables include *Age; Age^2; Education; Chronically Ill household head; log(Consumption); number of adult equivalents in the household; size of land holding; log(rainfall); log(local ganyu wage); distance to roads, BOMAs and national borders; maize and fertilizer prices; agro-climatic zone fixed effects*

Source: Own calculations using IHPS 2010-2013 data

Table 3 presents the main econometric results comparing the impact of the FISP between matrilocal and patrilocal communities, but the sample is limited to matrilineal households.[11]

[11]For the full results that also show coefficients on control variables, see Table C.7 in Appendix C. Table C.8 in Appendix C repeats these specifications, but also includes patrilineal and neo-local households in the sample. Our

Our first observation is that many findings from previous studies conceal heterogeneity between genders and settlement customs. If we limit our attention to the coefficient of *FISP*, which represents the subsidy's impact only in patrilocal communities, our results align with those documented in the literature for the country as a whole. Columns (1) to (3) show that FISP households in patrilocal communities are 13.1 percentage points more likely to sell maize at the market than non-FISP households in those communities and sell approximately 51.2% more output and earn about 88% more from selling maize than they do. This result was previously established for a national sample (Sibande et al., 2017), but those results are in fact applicable only in patrilocal communities.

The impact of the FISP on market interaction is distinct in matrilocal communities, where we do not observe any increase in the probability of selling maize. While the t-tests on the interactions in columns (2) and (3) lead us to conclude that the impact of the FISP in patrilocal and matrilocal communities is statistically identical, joint tests of $\widehat{\beta}_{FISP} + \widehat{\beta}_{FISP \times matrilineal}$ do not reject that the FISP has zero impact on the quantity and value of maize sold in matrilocal communities. The subsidy therefore conclusively increases market integration only in patrilocal communities.

Furthermore, *women* who live in patrilocal FISP households are 8.5 percentage points less likely to participate in *ganyu*. Again, this impact is unique to this group, with zero total impact for women in matrilocal communities and men in all communities. Women in matrilocal communities have low baseline participation in *ganyu* to begin with: in the absence of the FISP, they are 11.2 percentage points less likely to participate in *ganyu* than women in patrilocal communities. The FISP therefore does not introduce any *additional* shift in *ganyu* participation, and there is no reduction in precarious casual work for women in matrilocal communities. The results of Ricker-Gilbert (2014) therefore hide gender- and settlement-specific heterogeneity that our paper identifies.

In contrast, columns (4) and (5) show that the impact of the FISP on the propensity to make decisions about income from selling maize is concentrated only in matrilocal communities. Women who live in matrilocal FISP households have a 13.5 percentage point lower probability of making these decisions than their unsubsidised peers. The FISP has no such impact on women in patrilocal communities. The probability that women in non-FISP households are decision-makers does not differ by marital settlement arrangement. Men in matrilocal communities have a significant baseline disadvantage: they are 15.8 percentage points less likely to make decisions about income from maize sales than their counterparts in patrilocal communities. However, men in matrilocal communities who receive FISP benefits significantly improve their bargaining position relative to those who are not subsidised – their probability of making decisions about income from selling maize grows by 25.2 percentage points relative to other men in their communities. While the FISP has zero impact on men's decision-making powers in patrilocal communities, it transfers this power to male household heads in matrilocal communities, to the detriment of women's decision-making power and therefore also agency.

results remain robust to this adjustment.

The results presented include both individuals who changed location, moving into and out of matrilocal or patrilocal communities, and those who did not migrate between the two waves. It is therefore possible that the observed effects are driven by couples who move in the interest of acquiring land. Hence, post-marital settlement choices are potentially endogenous. For the sake of robustness, we also excluded those who moved across community types from the sample and re-estimated the effects of the FISP on our outcomes of interest. The results show that the programme's effects on our main outcomes remain robust: patrilocal households increase maize sales in response to the FISP, and matrilocal women lose decision-making power over earnings from maize sales while their spouses gain decision-making power.[12]

4.2 Discussion

Heterogeneity in the impact of the FISP enhances our understanding of the mechanisms through which it affects households. Presumably, the programme's well-documented productivity benefits should improve the well-being and social position of household members in relation to their internal bargaining power. However, in patrilocal communities – where income growth from the FISP is mostly concentrated – there is no shift in decision-making power over income from selling the subsidised crop. This is likely because the privilege of making decision about income from cash crops is already highly concentrated among men in patrilocal communities (see Table 2), so the FISP is insensitive to changing the gender imbalance. An increase in the value of the commodity over which men already have dominant command changes only total household liquidity, not who governs that liquidity.

Similarly, changes in bargaining power over income from maize sales are also disconnected from income growth in matrilocal communities. Income does not grow in response to FISP, but decision-making shifts towards men. This particular heterogeneous impact is key to understanding how the FISP affects household bargaining. Because changes in bargaining power are unrelated to income, there are other reasons why men have more decision-making power after receiving the FISP in matrilocal communities. Men who receive the subsidy increase their command over production inputs other than land, which is controlled by women and their extended families. While men in matrilocal communities also have considerable bargaining power over income from maize sales (see Table 2), column (5) of Table 3 and additional characteristics in Table B.4 show that the insignificant difference between settlement types is confounded by the FISP. Men in unsubsidised households in matrilocal communities are at a significant disadvantage relative to their peers in patrilocal communities. The subsidy, however, allows them to narrow the inter-community gap. While women in matrilocal communities had low bargaining power over income from maize sales to begin with, the FISP erodes it further. The effect sizes are asymmetric by gender: men gain more than women lose. Men in subsidised households in matrilocal communities therefore divert decision-making power over income from maize sales from individuals other than their wives. In this context – where decision-making extends

[12]These results are available from the authors upon request.

beyond the nuclear family – men use the subsidy to assert decision-making power that is often held by men in their spouses' kinship networks. Traditionally, male household heads in matrilocal communities have weaker land rights within their own nuclear households than their peers in patrilocal communities. Decisions about the land are also shared with their wives' extended family members (Mtika and Doctor, 2002). While it is not possible to verify, this dynamic might explain why productivity and market participation are unresponsive to the FISP in matrilocal regions. We hypothesise that husbands give subsidy vouchers to their wives' extended families in exchange for the right to make autonomous decisions about the land. While the IHPS contains questions about whether vouchers were redeemed or given to others, the sample of individuals who admit to giving them to others is restrictively small. We therefore cannot verify this proposition due to expected under-reporting in the survey data.[13]

While the FISP centralises decision-making power in nuclear families and away from broader kinship networks in matrilocal communities, it concentrates bargaining power in the hands of male household heads rather than women (Djurfeldt et al., 2018). Despite the matrilocal context, the FISP has no positive impacts on women, but partly emancipates husbands from the decisions of male members of their wives' extended families (Mtika and Doctor, 2002). In fact, the FISP changes the internal balance of power in matrilocal households to more closely resemble the pattern seen in patrilocal households: men have more decision-making power in their nuclear households and less competition from their wives' extended families (Walther, 2017). We argue that this shift occurs because men gain control over a production input (fertilizer vouchers) in subsidised households and therefore increase their control over managing the income from outputs. In unsubsidised matrilocal households, women's kinship networks traditionally have dominant control over inputs – mainly land – and male household heads who moved to their wives' communities do not have the same degree of dominance as in patrilocal communities.[14]

However, the FISP is not completely neutral towards women. It enables women in patrilocal communities to reduce their participation in casual *ganyu* labour. While they do not gain bargaining power over income from the market, the increased liquidity in FISP households allows some women to stop participating in precarious casual work. Our results do not indicate which activities they redirect their time to, though it is possible that they spend more time participating in leisure activities that are not captured in the data.[15] In matrilocal communities,

[13] An alternative hypothesis is that matrilocality is highly collinear with geographic features such as agro-ecological conditions and spatial patterns in socio-economic status. The poorest households live in the matrilocal south where maize production is generally lower. We re-estimated the models excluding regional fixed effects and obtained similar results. We therefore exclude this hypothesis.

[14] Our study precedes the 2016 Land Act that has enacted a shift to strengthen individual land rights and, by implication, the land rights of women in matrilocal communities. The impacts we measure could change if communities uphold and enforce these land rights. However, gender experts suggest that *de jure* land rights have not resulted in *de facto* changes for women.

[15] Table C.9 in Appendix C shows that the FISP does not significantly increase their participation in agricultural activities on their own plots. However, the data do not enable us to assess the possibility that they increased their *time* spent cultivating if they were *already* dedicating some of their time to this activity. Table C.9 shows that

women's participation in *ganyu* is unaffected by the FISP, as shown by the joint hypothesis tests of $\widehat{\beta}_{FISP} + \widehat{\beta}_{FISP \times matrilocal}$. On this count, married women in matrilocal communities also do not gain from the programme. Previous studies (Walther, 2017, 2018) show that women in matrilocal communities have only the threat of divorce as a credible means to gain bargaining power. While they are married, positive resource shocks such as the FISP do not shift decision-making power in their favour despite the fact that they live in a matrilineal and matrilocal system. Rather, the influence of their male extended family members diminishes the role that they and their husbands play in their households' affairs. Without control over any production inputs – whether it be the land that is administered by her extended family or fertiliser and seed inputs received by her husband – a woman in a matrilocal community makes few decisions about income from agricultural outputs (Djurfeldt et al., 2018). It is therefore unlikely that targeting these women with specific subsidies will have positive impacts on their bargaining power *unless* women's land rights are enforced *and* they gain control over an important production input.

Men, on the other hand, do not adjust their involvement in casual labour in any part of the country. In matrilocal communities, men gain decision-making power over *unchanged* income from the maize market. In patrilocal communities, the programme does not alter many outcomes for men. However, men in those communities leverage their growing income – over which they already have dominant decision-making power – to diversify their economic activity: the FISP has a positive impact on their ability to borrow and their propensity to engage in off-farm entrepreneurial activities (see Table C.9 in Appendix C).

women in patrilocal FISP households also do not have greater access to credit or participate more in entrepreneurial activities. In other results that we do not report, we find that women did not change the amount of time they spent collecting wood and doing household chores.

5 Conclusion

The paper aimed to identify the effects of farm input subsidies on women's agency and determine whether these agency-related effects differ based on the prevailing post-marital settlement system. In particular, we hypothesised that by offering households fertiliser and seed inputs that are not governed by gender-specific local practises determining land rights, it is possible that command over outputs would change the gender balance in decision-making. We drew evidence from Malawi, a country suitable for investigation on the topic due to its high levels of gender inequality, its pioneering implementation of a wide-spread targeted input subsidy programme (FISP) that has had positive impacts on cereal productivity, and the fact that it has two opposing post-marital settlement arrangements (patrilocality and matrilocality) that *co-exist* within the matrilinear inheritance system. These two arrangements provide different degrees of land rights to women and members of their extended families, with implications for their bargaining power.

We used the 2010 and 2013 waves of Malawi's IHPS, an individual-level panel dataset that is nationally representative. We estimated the heterogeneous effects on maize sales, decision-making about the use of earnings from maize sales and participation in casual labour. A notable challenge is the non-random selection of households under the FISP. Our identification follows a previous study (Ricker-Gilbert et al., 2013) and uses fixed effects.

The results showed that the FISP reduced women's decision-making power over earnings from selling maize in matrilocal communities, while it enabled their husbands to gain decision-making power. Maize sales – both the volume and value – significantly increased in response to the FISP, but only in patrilocal communities. The FISP reduced casual labour participation only among patrilocal women. Increases in household resources allowed women to leave precarious work, even if they did not gain any control over the additional income.

We speculate that the unresponsiveness of maize sales to the FISP in matrilocal communities could represent husbands exchanging FISP vouchers for the right to autonomously manage land from wives' kinship networks. Even if the FISP did not increase income from crops in these communities, men gained more control over income that they were already earning in a usual harvesting season. Husbands had more control over outputs because they gained control over production inputs. While this is a significant finding, small proportions of matrilocal farmers go to market before and after receiving the FISP. These changes in bargaining power therefore affect only a small part of the population. While this group is currently small, any growth in surplus production from the AIP can result in more widespread unintended consequences for gender inequality.

In matrilocal communities, therefore, the FISP changed the nature of gender inequality but did not reduce it. Despite the expectation that women in these communities should have greater *de jure* control over land as a production input, the bargaining power of extended family members erodes their decision-making power over outputs. Even when the FISP gives more direct command over inputs to households rather than to extended families, women still have

low command over outputs. Instead of women benefiting, bargaining power is transferred from their kinship networks to their husbands. Male household heads in matrilocal communities are "emancipated" from their *relative* disadvantage compared to men in patrilocal communities. Women do not experience similar relief from their more precarious experiences, and new inputs do not improve their bargaining power and in fact detract from it. Essentially, matrilocality and matrilineality do not ensure that policies like the FISP enhance gender equality.

In patrilocal communities, high gender inequality persists after the rollout of the FISP. Women are able to negotiate for some relief from precarious work but are still not in a position to assert decision-making power over income from agricultural outputs. While liquidity does alter labour-related decisions, it does not change command over resources, which ultimately determines gender equality in the longer term.

Would adding a gender-based focus to the FISP recipient criteria improve the bargaining power of disempowered women? Although our results do not give a conclusive verdict on this scenario, the impacts measured do provide a good exploratory basis for future policy design. In particular, the results seem to encourage policy projects that provide different forms of welfare assistance to rural communities based on their prevailing post-marital settlement arrangements. Therefore, if empowering women should be one of the goals of the FISP, then matrilocal and patrilocal women may need to be targeted differently. However, there are also questions about whether subsidised agricultural inputs are necessarily the best way to improve women's agency in different land settlement contexts.

While one could expect changes in inputs to alter decision-making patterns within households, our study shows that prevailing customs limit how this can promote gender equality. A core constraint in Malawi is the poor recognition and enforcement of individual land rights, which can facilitate control over outputs. Especially in matrilocal communities, where women should *de jure* have greater decision-making power over the use of land, interventions to improve these rights may change the gender inequality we document. Our study did not measure the role that the 2016 Land Act, which intended to reinforce individual smallholder land rights, could have had. If this legislation was effective, women, especially those in matrilocal communities, would be in a better position to assert their land rights and therefore agency over productive inputs *vis-à-vis* their extended families and husbands. However, there is a reported gap between the legislation and its enforcement. The *de facto* position of women may therefore remain unchanged in response. Future research would have to first quantitatively assess whether existing legislation has had any intended effects and then determine how local and national policy processes can facilitate the intended effects. Other channels outside of both formal land rights and subsidised agricultural inputs, such as better quality education for women, may be needed.

Some secondary research themes also arise from our work. Female decision-making power is closely linked to other household outcomes such as child nutrition (Ruel et al., 2018). More research is needed to build on our findings and investigate whether the heterogeneity of the effects on female agency based on post-marital settlement systems has second-round effects on

other household welfare outcomes. Further, subject to data availability, future research should investigate where patrilocal women invest their time when they participate less in casual labour. This will help to understand whether the effects improve gender equality or represent a reallocation of women's time to other activities that perpetuate gender inequality.

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Appendices

A Factors that affect FISP participation

The FISP programme was initially designed to allow poor-productive farmers that have land for cultivation access maize fertilizer and hybrid seed (Karamba and Winters, 2015).This directed more vouchers to the central region of Malawi that has suitable climate for maize production. Later on the programme changed to prioritise poor and vulnerable households, such as the elderly, those caring for the sick driving more vouchers to the poor and densely populated south region (Lunduka et al., 2013). These government set criteria, are however, not always followed such that there exists some idiosyncrasy; community members decide who exactly a beneficiary should be (Poulton, 2012). Nevertheless, previous evidence (Karamba and Winters, 2015; Fisher and Kandiwa, 2014; Kilic et al., 2014; Lunduka et al., 2013) reveals that some attributes remain important predictors of FISP participation. Therefore, we selected our FISP determinants following this literature while also considering the government-set guidelines for selection. A presents these attributes and shows their relationship with FISP in our sample.

Age of the household head was included because the FISP program targets the elderly. Older people are also anticipated to be vulnerable; they are relatively less involved in the labour market. Educated people have relatively better jobs and high income than the uneducated; the educated are less likely to be vulnerable. Household size is included because poor households tend to be large. This is likely because of a large responsibility of the heads to care for families. On the other hand, large households may have more labour to cultivate in the farm than small households. We therefore, included household size. Consumption is a standard measure that Malawi government uses to compute poverty estimates. Furthermore, rural areas consider food poverty (the largest share of household consumption), particularly scarcity of maize for a family, as an indicator of poverty (GoM, 2018; Cromwell and Kyegombe, 2005). We therefore include log of per-capita consumption as a determinant [16]. We choose consumption, unlike other studies that use wealth, to avoid subjectivity in constructing a wealth index. The FISP programme provides vouchers to farmers that have land for cultivation (Karamba and Winters, 2015; Chirwa and Andrew, 2013). Land ownership is therefore an important predictor of FISP participation and we therefore include this variable in our participation equation. We control for agro-econological zones to remove differences in probability to participate based on climate variations. We also include regional dummies. This is because FISP voucher distribution also follows population density; areas with more people receive more vouchers (Karamba and Winters, 2015).

[16] We also estimated the participation logit using a *wealth index*. We found results that are consistent with those of some authors (Kilic et al., 2015) but not others (Karamba and Winters, 2015). Various estimates of the propensity score did not change the main conclusions of our findings. Both authors used our dataset- the Malawi IHS3

Table A.1: Factors that affect participation into FISP

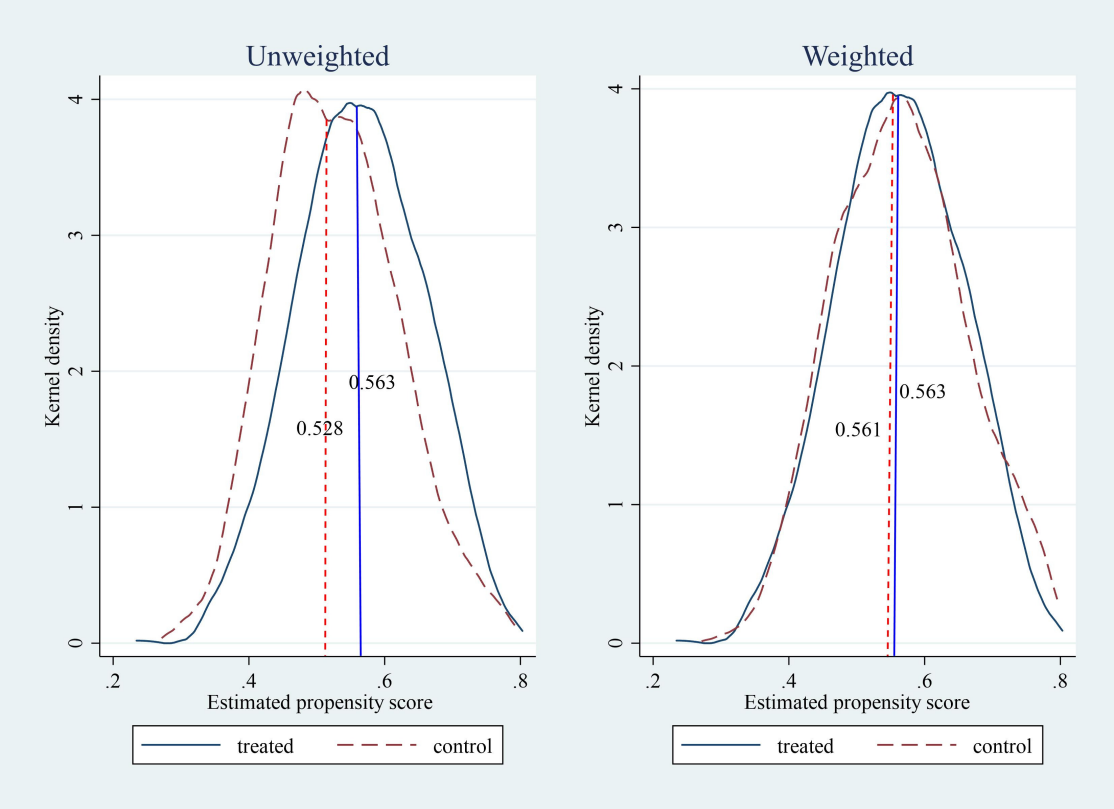
	(1)
	FISP participation
Age	0.004***
	(0.001)
Educated	-0.026
	(0.040)
Household size	-0.010
	(0.008)
log (consumption)	-0.077***
	(0.026)
Land holding	0.052**
	(0.023)
Cool semiarid	0.062
	(0.084)
Warm subhumid	0.127
	(0.079)
Warm semiarid	0.116
	(0.079)
Central region	0.046
	(0.068)
Southern region	0.065
	(0.068)
N	1224

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The table provides marginal effects form a logit model of participation in FISP

Figure A.1: The Kernel density distribution of propensity scores between the treated(FISP) and control(non-FISP) households



B Descriptive statistics

Table B.2: Definition of Variables Used

	(1) FISP participation
Sale	Participation in the sale of maize
Output	Kilograms of maize sold
Value	Malawi Kwacha market valu of the maize sold
Age	A continuous variable capturing the age of respondent
Educated	A dummy variable capturing whether respondent attended school or not
Household size	A continuous variable capturing number of individuals within a households
log (consumption)	A continuous variable capturing the market value of percapita consumption for a household
illness	A dummy variable taking the value 1 if the household head is chronically ill and 0 otherwise
Land holding	A continuous variable capturing number of hectares belonging to the respondent's household
Cool semiarid	A dummy variable capturing whether the respondent's household is in this agro-ecological zone or not
Adult Equivalent	A continuous variable [a]
Time	A continuous variable for number of years since the household arrived in that area
Rainfall	A continuous capturing millilitres of Rains within a cluster
Wages	Median community wage for *ganyu*.
Road	Distance to the nearest paved road in Kilometers.
BOMA	Distance to the nearest BOMA in kilometers
Border	Distance to the nearest border post in Kilometers
Maize_Price	A community average price of maize–Malawi's staple food
Fertilizer_Price	A community average price of fertilizer
Warm subhumid	A dummy variable capturing whether the respondent's household is in this agro-ecological zone or not
Warm semiarid	A dummy variable capturing whether the respondent's household is in this agro-ecological zone or not
Warm semiarid	A dummy variable capturing whether the respondent's household is in this agro-ecological zone or not
Northern region	Dummy variable capturing whether the respondents household is located in the Northern region or not
Central region	Dummy variable capturing whether the respondents household is located in the Central region or not
Southern region	Dummy variable capturing whether the respondents household is located in the Southern region or not

[a] created to normalize the nutritional needs of different family members in a household based on age and gender (see for example Ricker-Gilbert et al. (2013) for calculation.

Table B.3: The differences in household characteristics by FISP

	Patrilocal			Matrilocal		
	FISP	Non-FISP	diff	FISP	Non-FISP	diff
Sale	0.71	0.52	0.19***	0.46	0.38	0.08*
Output	114.37	34.02	80.35**	20.92	17.35	3.58
Value	5352.13	2331.69	3020.44	1399.08	1019.64	379.43
Illness	0.07	0.05	0.01	0.09	0.10	-0.01
Consumption	132624.54	136172.06	-3547.51	127937.40	152095.59	-24158.19**
AE	4.54	4.43	0.11	4.40	4.38	0.02
Hectarage	1.11	0.91	0.19**	0.79	0.70	0.09
Time	33.19	27.52	5.68***	29.99	25.20	4.79**
Rainfall	839.07	822.55	16.52***	806.60	808.15	-1.55
Wages	361.25	343.06	18.19	312.47	359.56	-47.08
Road_KM	10.93	10.57	0.36	11.00	10.21	0.79
BOMA_KM	53.52	45.36	8.15**	37.19	36.98	0.21
Boarder_KM	49.66	51.11	-1.45	36.72	34.22	2.50
Maize_Price	50.84	54.19	-3.35**	58.33	58.22	0.11
Fertilizer_Price	78.14	67.71	10.42*	90.16	84.36	5.81
Warmsemiarid	0.63	0.57	0.06	0.39	0.46	-0.07
Warmsubhumid	0.10	0.15	-0.04	0.52	0.42	0.11**
Coolsemiarid	0.23	0.20	0.03	0.06	0.09	-0.04
Coolsubhumid	0.04	0.08	-0.04*	0.03	0.03	-0.00
North	0.12	0.12	-0.00	0.01	0.01	0.01
Central	0.82	0.72	0.10**	0.18	0.28	-0.10**
South	0.06	0.16	-0.10***	0.81	0.72	0.09**
2010	0.57	0.45	0.13**	0.51	0.47	0.04
2013	0.43	0.55	-0.13**	0.49	0.53	-0.04
Observations	263	261	524	406	294	700

Table B.4: The differences in household characteristics by marriage arrangement

	FISP			Non-FISP		
	Matrilocal	Patrilocal	diff	Matrilocal	Patrilocal	diff
Sale	0.46	0.71	-0.24***	0.38	0.52	-0.14**
Output	20.92	114.37	-93.45***	17.35	34.02	-16.68
Value	1399.08	5352.13	-3953.05**	1019.64	2331.69	-1312.04
Illness	0.09	0.07	0.03	0.10	0.05	0.04*
Consumption	127937.40	132624.54	-4687.14	152095.59	136172.06	15923.54
AE	4.40	4.54	-0.14	4.38	4.43	-0.05
Hectarage	0.79	1.11	-0.31***	0.70	0.91	-0.21***
Time	29.99	33.19	-3.21*	25.20	27.52	-2.32
Rainfall	806.60	839.07	-32.46***	808.15	822.55	-14.40**
Wages	312.47	361.25	-48.77	359.56	343.06	16.50
Road_KM	11.00	10.93	0.08	10.21	10.57	-0.36
BOMA_KM	37.19	53.52	-16.33***	36.98	45.36	-8.38***
Boarder_KM	36.72	49.66	-12.94***	34.22	51.11	-16.89***
Maize_Price	58.33	50.84	7.49***	58.22	54.19	4.03***
Fertilizer_Price	90.16	78.14	12.03**	84.36	67.71	16.64***
Warmsemiarid	0.39	0.63	-0.24***	0.46	0.57	-0.12**
Warmsubhumid	0.52	0.10	0.42***	0.42	0.15	0.27***
Coolsemiarid	0.06	0.23	-0.18***	0.09	0.20	-0.11***
Coolsubhumid	0.03	0.04	-0.01	0.03	0.08	-0.05*
North	0.01	0.12	-0.11***	0.01	0.12	-0.12***
Central	0.18	0.82	-0.64***	0.28	0.72	-0.44***
South	0.81	0.06	0.74***	0.72	0.16	0.56***
2010	0.51	0.57	-0.06	0.47	0.45	0.02
2013	0.49	0.43	0.06	0.53	0.55	-0.02
Observations	406	263	669	294	261	555

Table B.5: Differences in individual characteristics by FISP

	Female: Patrilocal			Female: Matrilocal			Male: Patrilocal			Male: Matrilocal		
	FISP	None	diff	FISP	None	diff	FISP	None	diff	FISP	None	diff
Decision	0.06	0.03	0.04	0.08	0.11	-0.03	0.90	0.95	-0.05	0.91	0.87	0.04
Ganyu	0.06	0.12	-0.06*	0.05	0.07	-0.02	0.15	0.17	-0.02	0.14	0.18	-0.04
Ganyu hrs	0.74	2.02	-1.28*	0.70	1.12	-0.42	2.75	2.96	-0.21	2.84	4.28	-1.44
Own farm hrs	9.88	7.64	2.24*	10.29	8.62	1.67	10.68	8.64	2.04	10.84	8.87	1.97*
Job hrs	0.04	0.85	-0.81*	0.60	0.88	-0.28	1.99	5.43	-3.44**	6.13	10.67	-4.53**
Water hrs	0.72	0.75	-0.03	0.70	0.73	-0.04	0.05	0.05	0.00	0.02	0.02	0.00
Firewood hrs	0.47	0.45	0.02	0.40	0.38	0.02	0.07	0.06	0.01	0.02	0.02	0.01
Age	37.71	35.63	2.08	38.47	33.65	4.82***	43.66	41.66	2.00	45.12	39.48	5.64***
Educated	0.69	0.73	-0.04	0.67	0.75	-0.07*	0.81	0.86	-0.05	0.82	0.86	-0.04
Observations	261	263	524	405	295	700	263	261	524	406	294	700

Table B.6: Differences in individual characteristics by gender

	FISP: Patrilocal			FISP: Matrilocal			Non-FISP: Patrilocal			Non-FISP: Matrilocal		
	Male	Female	diff	Male	Female	diff	Male	Female	diff	Male	Female	diff
Decision	0.90	0.06	0.83***	0.91	0.08	0.82***	0.95	0.03	0.92***	0.87	0.11	0.75***
Ganyu [a]	0.15	0.06	0.09***	0.14	0.05	0.09***	0.17	0.12	0.05	0.18	0.07	0.11***
Ganyu hrs	2.75	0.74	2.02**	2.84	0.70	2.14***	2.96	2.02	0.94	4.28	1.12	3.16***
Own farm hrs	10.68	9.88	0.80	10.84	10.29	0.55	8.64	7.64	1.01	8.87	8.62	0.25
Job hrs	1.99	0.04	1.95**	6.13	0.60	5.53***	5.43	0.85	4.59***	10.67	0.88	9.79***
Water hrs	0.05	0.72	-0.67***	0.02	0.70	-0.67***	0.05	0.75	-0.70***	0.02	0.73	-0.71***
Firewood hrs	0.07	0.47	-0.40***	0.02	0.40	-0.38***	0.06	0.45	-0.39***	0.02	0.38	-0.36***
Age	43.66	37.71	5.95***	45.12	38.47	6.65***	41.66	35.63	6.03***	39.48	33.65	5.83***
Educated	0.81	0.69	0.12**	0.82	0.67	0.15***	0.86	0.73	0.13***	0.86	0.75	0.12***
Observations	263	261	524	406	405	811	261	263	524	294	295	589

[a] Weekly participation

C Additional Results

Table C.7: Main results showing a full set of controls: the effects of FISP on decision making, maize sales and ganyu

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Households			Women	Men	Women	Men
	LPM	Tobit-RE		LPM			
	Seller	Quantity	Value	Decider	Decider	*Ganyu*	*Ganyu*
FISP	0.131***	0.512**	0.878**	-0.006	-0.089	-0.085**	0.037
	(0.046)	(0.248)	(0.439)	(0.048)	(0.057)	(0.041)	(0.062)
matrilocal	0.057	0.138	0.242	0.080	-0.158**	-0.112**	-0.006
	(0.049)	(0.299)	(0.525)	(0.067)	(0.075)	(0.052)	(0.059)
FISP×Matrilocal	-0.132**	-0.481	-0.834	-0.135*	0.252***	0.087*	-0.000
	(0.059)	(0.334)	(0.593)	(0.081)	(0.091)	(0.052)	(0.073)
Age	0.011	0.005	0.020	-0.005	0.004	-0.014	-0.021
	(0.017)	(0.107)	(0.190)	(0.024)	(0.034)	(0.013)	(0.022)
Age2	0.000	0.000	0.001	0.000	-0.000	0.000	0.000
	(0.000)	(0.001)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)
Educated	-0.037	-0.252	-0.436	0.024	-0.242**	0.039	0.148***
	(0.030)	(0.314)	(0.552)	(0.069)	(0.115)	(0.044)	(0.050)
Illness	0.027	0.171	0.331	0.031	-0.177*	0.010	0.018
	(0.044)	(0.257)	(0.458)	(0.058)	(0.102)	(0.050)	(0.049)
Consumption(log)	0.027	0.212	0.355	0.005	0.029	-0.071**	0.044
	(0.024)	(0.153)	(0.270)	(0.048)	(0.054)	(0.028)	(0.031)
AE	-0.011	-0.042	-0.075	0.014	-0.029	-0.001	0.001
	(0.008)	(0.055)	(0.098)	(0.014)	(0.019)	(0.007)	(0.011)
Hectarage	0.004	0.026	0.045	-0.012	0.012	-0.006	0.022
	(0.025)	(0.128)	(0.226)	(0.030)	(0.036)	(0.016)	(0.019)
Time	-0.001	0.006	0.010	-0.003	0.002	0.000	0.001
	(0.001)	(0.003)	(0.006)	(0.002)	(0.001)	(0.001)	(0.001)
Rainfall(log)	0.780	2.712	3.782	-2.094	0.557	-0.069	-0.170
	(0.744)	(4.758)	(8.398)	(1.761)	(1.917)	(0.772)	(0.802)
Wages(log)	-0.079**	-0.261	-0.526	-0.031	0.026	-0.020	0.030
	(0.038)	(0.202)	(0.360)	(0.043)	(0.050)	(0.026)	(0.040)
Road_KM	-0.001	0.023	0.042	-0.050**	0.040	0.007	-0.007
	(0.005)	(0.029)	(0.051)	(0.025)	(0.028)	(0.005)	(0.007)
BOMA_KM	0.002***	0.007*	0.012*	-0.001	0.000	0.001	-0.001
	(0.001)	(0.004)	(0.007)	(0.001)	(0.002)	(0.001)	(0.001)
Boarder_KM	0.003***	0.007**	0.013**	-0.002	-0.000	-0.000	-0.000
	(0.001)	(0.003)	(0.006)	(0.002)	(0.003)	(0.001)	(0.001)
Maize_price	0.000	0.004	0.008	-0.003	0.005	0.000	-0.001
	(0.002)	(0.012)	(0.022)	(0.004)	(0.004)	(0.002)	(0.003)
Fertilizer_price	0.000	0.002	0.004	0.000	-0.000	0.000	0.000
	(0.000)	(0.001)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)
Cool semiarid	-0.094	-0.481*	-0.863*	0.985***	-0.487***	0.125	0.015
	(0.176)	(0.287)	(0.506)	(0.103)	(0.187)	(0.114)	(0.221)
Warm subhumid	-0.080	-0.146	-0.255	0.468	0.047	-0.083	-0.171
	(0.179)	(0.271)	(0.477)	(0.344)	(0.397)	(0.131)	(0.204)
Warm semiarid	-0.260	-0.412	-0.740	0.990***	-0.483**	-0.164	-0.050
	(0.249)	(0.262)	(0.461)	(0.196)	(0.214)	(0.146)	(0.243)
Year 2013	0.044	0.143	0.361	0.155*	-0.112	0.052	-0.029
	(0.067)	(0.392)	(0.699)	(0.090)	(0.096)	(0.052)	(0.076)
North	-1.576***	-1.177***	-2.049***	0.208	0.012	0.049	-0.291
	(0.321)	(0.386)	(0.683)	(0.367)	(0.414)	(0.235)	(0.385)
Central	-0.421	0.244	0.441	0.000	0.000	0.091	-0.330
	(0.323)	(0.246)	(0.439)	(.)	(.)	(0.082)	(0.303)
_cons	-5.210			14.184	-2.929	1.699	1.526
	(4.908)			(11.937)	(12.464)	(5.175)	(5.406)
p-val: $\widehat{\beta}_F + \widehat{\beta}_{F\times M} = 0$	0.985	0.895	0.915	0.056	0.034	0.953	0.401
F	21.136			.	.	0.807	1.005
N	1207	1207	1207	616	615	1200	1207

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table C.8: Main results, but including **all** patrilocal households: The effects of FISP on decision making, maize sales and ganyu

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Households			Women	Men	Women	Men
	LPM	Tobit-RE		LPM			
	Seller	Quantity	Value	Decider	Decider	*Ganyu*	*Ganyu*
FISP	0.138***	0.546***	0.944***	-0.021	-0.047	-0.049*	0.036
	(0.039)	(0.177)	(0.313)	(0.044)	(0.051)	(0.030)	(0.047)
matrilocality	0.060	0.151	0.259	0.066	-0.114*	-0.057	0.004
	(0.050)	(0.231)	(0.409)	(0.055)	(0.061)	(0.046)	(0.052)
FISP×Matrilocal	-0.144***	-0.527**	-0.917**	-0.123*	0.211**	0.052	0.002
	(0.055)	(0.262)	(0.463)	(0.074)	(0.082)	(0.046)	(0.061)
Age	0.003	-0.002	0.003	-0.014	0.013	-0.014	-0.012
	(0.016)	(0.096)	(0.169)	(0.024)	(0.030)	(0.013)	(0.021)
Age2	0.000	0.001	0.001	0.000	-0.000	0.000	0.000
	(0.000)	(0.001)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)
Educated	0.002	0.196	0.381	0.023	-0.185*	0.032	0.126***
	(0.034)	(0.286)	(0.506)	(0.067)	(0.104)	(0.036)	(0.044)
Illness	0.049	0.370	0.687	-0.016	-0.084	0.014	-0.003
	(0.046)	(0.269)	(0.476)	(0.070)	(0.098)	(0.041)	(0.046)
Consumption(log)	0.034	0.222	0.360	-0.003	0.048	-0.061**	0.039
	(0.026)	(0.147)	(0.260)	(0.045)	(0.051)	(0.024)	(0.028)
AE	-0.000	-0.003	-0.008	0.008	-0.023	-0.003	0.003
	(0.009)	(0.053)	(0.094)	(0.016)	(0.020)	(0.007)	(0.009)
Hectarage	0.016	0.089	0.162	-0.011	0.015	-0.004	0.021
	(0.022)	(0.118)	(0.209)	(0.026)	(0.029)	(0.013)	(0.018)
Time	0.000	0.005	0.008	-0.002	0.001	0.000	0.000
	(0.001)	(0.003)	(0.006)	(0.002)	(0.002)	(0.001)	(0.001)
Rainfall(log)	1.125	3.311	4.919	0.243	-1.229	0.234	-0.267
	(0.711)	(4.258)	(7.523)	(1.658)	(1.714)	(0.601)	(0.675)
Wage(log)	-0.046	-0.154	-0.324	-0.038	0.056	0.003	0.026
	(0.033)	(0.147)	(0.260)	(0.040)	(0.046)	(0.019)	(0.034)
Road_KM	-0.000	0.016	0.030	-0.049**	0.035	0.006	-0.003
	(0.005)	(0.028)	(0.050)	(0.021)	(0.022)	(0.005)	(0.007)
BOMA_KM	0.002***	0.008	0.015	0.000	-0.000	0.001	-0.002*
	(0.001)	(0.006)	(0.010)	(0.001)	(0.002)	(0.001)	(0.001)
Bourder_KM	0.003***	0.010*	0.017*	0.000	-0.000	0.000	-0.001
	(0.001)	(0.006)	(0.010)	(0.002)	(0.002)	(0.001)	(0.001)
Maize_price	0.001	0.004	0.006	-0.003	0.003	0.001	-0.001
	(0.002)	(0.010)	(0.018)	(0.003)	(0.003)	(0.002)	(0.002)
Fertilizer_price	0.000*	0.002	0.003	0.000	-0.000	0.000	-0.000
	(0.000)	(0.001)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)
Cool semiarid	0.070	-0.804***	-1.427***	0.905***	-0.622***	0.238	-0.031
	(0.237)	(0.261)	(0.462)	(0.151)	(0.158)	(0.154)	(0.175)
Warm subhumid	0.136	-0.370**	-0.648**	0.098	-0.042	0.117	-0.222*
	(0.155)	(0.179)	(0.316)	(0.229)	(0.162)	(0.135)	(0.129)
Warm semiarid	-0.123	-0.706***	-1.259***	0.862***	-0.624***	0.002	-0.157
	(0.222)	(0.215)	(0.379)	(0.205)	(0.193)	(0.158)	(0.202)
Year 2013	-0.007	-0.018	0.093	0.149*	-0.126	0.015	-0.034
	(0.064)	(0.317)	(0.560)	(0.080)	(0.088)	(0.041)	(0.067)
North	-0.768**	-0.964***	-1.638***	0.066	-0.108	0.125	-0.116
	(0.341)	(0.355)	(0.626)	(0.273)	(0.234)	(0.160)	(0.241)
Central	-0.107	0.135	0.258	0.000	0.000	0.064	-0.220
	(0.318)	(0.220)	(0.387)	(.)	(.)	(0.092)	(0.249)
_cons	-7.922*			-1.142	8.592	-0.783	2.008
	(4.750)			(11.226)	(11.348)	(4.036)	(4.582)
p-val: $\widehat{\beta}_F + \widehat{\beta}_{F\times M} = 0$	0.875	0.925	0.941	0.049	0.031	0.933	0.385
F	2.185			.	.	0.822	0.959
N	1707	1707	1707	833	830	1702	1707

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table C.9: Additional outcomes: The effects of FISP on own-farming, borrowing and business ownership

	(1)	(2)	(3)	(4)	(5)	(6)
	Women	Men	Women	Men	Women	Men
			LPM			
	Own_farming	Own_farming	Credit	Credit	Business	Business
FISP	0.057	0.003	-0.043	0.063	0.001	0.119***
	(0.070)	(0.070)	(0.040)	(0.051)	(0.031)	(0.043)
Matrilocal	0.032	-0.030	-0.067	0.011	-0.018	0.122**
	(0.083)	(0.070)	(0.053)	(0.053)	(0.050)	(0.050)
FISP×Matrilocal	-0.029	0.053	0.101**	-0.021	-0.035	-0.155**
	(0.092)	(0.090)	(0.051)	(0.062)	(0.043)	(0.063)
Age	0.008	0.020	0.011	0.030*	0.007	0.017
	(0.024)	(0.025)	(0.011)	(0.017)	(0.012)	(0.017)
Age2	-0.000	-0.000	-0.000	-0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Educated	0.014	-0.006	0.030	-0.005	-0.030	0.011
	(0.079)	(0.068)	(0.036)	(0.050)	(0.047)	(0.042)
Illness	-0.028	-0.033	-0.014	0.109*	0.115***	-0.054
	(0.074)	(0.074)	(0.032)	(0.063)	(0.044)	(0.067)
Consumption(log)	0.073	0.128***	0.001	-0.044	-0.045*	0.061*
	(0.047)	(0.043)	(0.021)	(0.032)	(0.025)	(0.034)
AE	0.022	0.024	-0.003	0.005	-0.004	-0.024**
	(0.017)	(0.015)	(0.008)	(0.015)	(0.009)	(0.012)
Hectarage	0.033	0.046	0.019	0.026	0.001	0.020
	(0.041)	(0.040)	(0.016)	(0.026)	(0.015)	(0.021)
Time	-0.001	0.001	0.000	-0.000	-0.001	-0.003**
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Rainfall(log)	-0.687	0.464	-1.041	1.322	0.084	0.655
	(1.530)	(1.449)	(0.725)	(0.892)	(0.742)	(1.031)
Wages(log)	0.034	0.050	-0.074**	-0.017	-0.031	-0.070*
	(0.059)	(0.046)	(0.032)	(0.039)	(0.027)	(0.041)
Road_KM	0.009	0.011	0.002	-0.006	0.008*	-0.003
	(0.010)	(0.008)	(0.004)	(0.007)	(0.005)	(0.005)
BOMA_KM	-0.001	-0.002	0.001	0.001	0.000	0.002**
	(0.001)	(0.002)	(0.001)	(0.001)	(0.000)	(0.001)
Boarder_KM	-0.000	-0.002	0.000	0.000	0.000	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Maize_price	0.003	0.005	0.001	0.002	0.006***	0.003
	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
Fertilizer_price	-0.000	-0.001	0.000	0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Cool semiarid	-0.250	-0.085	0.149	-0.002	-0.232	-0.067
	(0.199)	(0.206)	(0.233)	(0.123)	(0.179)	(0.149)
Warm subhumid	0.051	0.003	0.199	0.015	-0.010	-0.148
	(0.228)	(0.248)	(0.282)	(0.129)	(0.159)	(0.161)
Warm semiarid	-0.112	0.139	0.140	-0.213	-0.299	-0.380**
	(0.214)	(0.230)	(0.272)	(0.151)	(0.190)	(0.176)
Year 2013	-0.136	-0.295***	0.114*	-0.029	-0.079	0.011
	(0.107)	(0.103)	(0.058)	(0.070)	(0.059)	(0.081)
North	0.197	0.476	0.135	-0.302	0.203	-0.000
	(0.585)	(0.597)	(0.289)	(0.221)	(0.368)	(0.337)
Central	-0.479	-0.476	-0.019	0.036	0.456	0.283
	(0.352)	(0.312)	(0.073)	(0.123)	(0.303)	(0.272)
_cons	4.186	-4.841	6.798	-9.040	-0.458	-5.070
	(10.349)	(9.832)	(4.898)	(6.024)	(5.085)	(7.000)
p-val: $\widehat{\beta}_F + \widehat{\beta}_{F\times M} = 0$	0.650	0.360	0.045	0.263	0.315	0.458
F	1.044	2.036	1.955	0.978	2.067	2.755
N	1200	1207	1200	1207	1200	1207

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table C.10: Additional outcomes, but including all patrilocal households: The effects of FISP on own-farming, borrowing and business ownership

	(1)	(2)	(3)	(4)	(5)	(6)
	Women	Men	Women	Men	Women	Men
	LPM					
	Own_farming	Own_farming	Credit	Credit	Business	Business
FISP	0.043	0.052	-0.027	0.070*	0.009	0.065*
	(0.059)	(0.059)	(0.028)	(0.037)	(0.026)	(0.035)
matrilocality	-0.003	-0.023	-0.050	0.016	-0.018	0.097**
	(0.075)	(0.067)	(0.043)	(0.047)	(0.043)	(0.045)
FISP×Matrilocal	-0.034	0.010	0.083**	-0.026	-0.044	-0.108*
	(0.083)	(0.081)	(0.042)	(0.053)	(0.039)	(0.058)
Age	0.007	0.018	0.013	0.031**	0.006	0.015
	(0.027)	(0.026)	(0.010)	(0.015)	(0.011)	(0.015)
Age2	-0.000	-0.000	-0.000	-0.000**	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Educated	-0.005	-0.031	0.036	0.018	-0.033	0.019
	(0.067)	(0.060)	(0.026)	(0.042)	(0.037)	(0.035)
Illness	-0.074	-0.062	-0.020	0.073	0.082**	-0.018
	(0.075)	(0.073)	(0.031)	(0.052)	(0.038)	(0.060)
Consumption(log)	0.059	0.102**	-0.001	-0.038	-0.027	0.047
	(0.045)	(0.040)	(0.019)	(0.027)	(0.022)	(0.031)
AE	0.018	0.016	-0.006	0.005	-0.003	-0.013
	(0.014)	(0.014)	(0.008)	(0.012)	(0.009)	(0.010)
Hectarage	0.025	0.026	0.026*	0.019	0.005	0.011
	(0.039)	(0.038)	(0.014)	(0.022)	(0.013)	(0.019)
Time	0.002	0.000	0.000	0.000	-0.001	-0.003***
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Rainfall(log)	-1.755	-1.097	-0.797	2.080***	0.641	1.397*
	(1.253)	(1.140)	(0.571)	(0.800)	(0.595)	(0.776)
Wages(log)	-0.027	-0.023	-0.034	-0.020	-0.027	-0.036
	(0.050)	(0.043)	(0.024)	(0.030)	(0.021)	(0.032)
Road_KM	0.004	0.010	0.003	-0.003	0.009*	-0.001
	(0.009)	(0.007)	(0.003)	(0.006)	(0.005)	(0.005)
BOMA_KM	-0.001	-0.002	0.000	0.000	-0.000	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Boarder_KM	-0.001	-0.002*	0.001	0.000	-0.000	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Maize_price	0.003	0.004	0.000	0.002	0.004**	0.000
	(0.003)	(0.003)	(0.001)	(0.002)	(0.002)	(0.002)
Fertilizer_price	-0.000	-0.000	0.000**	0.000*	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Cool semiarid	-0.300	-0.218	0.053	0.046	-0.232*	0.097
	(0.213)	(0.248)	(0.100)	(0.134)	(0.141)	(0.166)
Warm subhumid	0.009	-0.179	0.126	0.081	-0.090	0.136
	(0.189)	(0.180)	(0.109)	(0.101)	(0.085)	(0.121)
Warm semiarid	-0.130	-0.076	0.029	-0.132	-0.335**	-0.107
	(0.220)	(0.215)	(0.110)	(0.153)	(0.160)	(0.159)
Year 2013	-0.062	-0.156	0.079*	-0.027	-0.032	0.017
	(0.099)	(0.101)	(0.046)	(0.054)	(0.048)	(0.067)
North	0.289	0.459	0.200	-0.381*	0.061	-0.107
	(0.384)	(0.345)	(0.141)	(0.226)	(0.208)	(0.265)
Central	-0.392	-0.371	0.044	-0.029	0.397	0.134
	(0.303)	(0.284)	(0.069)	(0.106)	(0.247)	(0.217)
_cons	11.811	6.521	5.011	-14.311***	-4.218	-10.220*
	(8.582)	(7.824)	(3.871)	(5.415)	(4.051)	(5.300)
p-val: $\widehat{\beta}_F + \widehat{\beta}_{F\times M} = 0$	0.883	0.287	0.046	0.244	0.282	0.355
F	1.123	1.657	2.134	1.213	1.771	3.167
N	1702	1707	1702	1707	1702	1707

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

D Female Headed Households Descriptive Statistics

Table D.11: The differences in household characteristics by FISP

	Patrilocal			Matrilocal		
	FISP	Non-FISP	diff	FISP	Non-FISP	diff
Sale	0.64	0.60	0.04	0.31	0.32	-0.01
Output	50.00	20.00	30.00	6.25	9.64	-3.39
Value	4181.82	600.00	3581.82	135.94	714.29	-578.35
Illness	0.27	0.00	0.27	0.09	0.00	0.09
Consumption	157916.30	153505.31	4410.99	172244.34	170715.08	1529.27
AE	4.56	3.84	0.72	4.29	3.51	0.78
Hectarage	0.83	0.60	0.23	0.57	0.51	0.07
Time	39.30	22.00	17.30	26.97	14.46	12.50**
Rainfall	847.55	831.70	15.85	814.37	807.55	6.82
Wages	370.00	290.00	80.00	228.75	341.30	-112.55**
Road_KM	13.49	7.17	6.32	10.02	7.51	2.51
BOMA_KM	41.11	36.72	4.39	35.28	24.37	10.92
Boarder_KM	49.62	41.72	7.90	24.00	33.93	-9.93
Maize_Price	54.62	53.28	1.34	53.98	65.61	-11.63**
Fertilizer_Price	77.12	59.84	17.28	97.24	106.25	-9.01
Warmsemiarid	0.55	0.60	-0.05	0.28	0.29	-0.00
Warmsubhumid	0.09	0.10	-0.01	0.63	0.64	-0.02
Coolsemiarid	0.27	0.20	0.07	0.09	0.07	0.02
Coolsubhumid	0.09	0.10	-0.01	0.00	0.00	0.00
North	0.00	0.00	0.00	0.00	0.00	0.00
Central	0.91	0.80	0.11	0.13	0.07	0.05
South	0.09	0.20	-0.11	0.88	0.93	-0.05
2010	0.55	0.50	0.05	0.69	0.29	0.40**
2013	0.45	0.50	-0.05	0.31	0.71	-0.40**
Observations	11	10	21	32	28	60

Table D.12: The differences in household characteristics by marriage arrangement

	FISP			No-FISP		
	Matrilocal	Patrilocal	diff	Matrilocal	Patrilocal	diff
Sale	0.31	0.64	-0.32	0.32	0.60	-0.28
Output	6.25	50.00	-43.75	9.64	20.00	-10.36
Value	135.94	4181.82	-4045.88	714.29	600.00	114.29
Illness	0.09	0.27	-0.18	0.00	0.00	0.00
Consumption	172244.34	157916.30	14328.04	170715.08	153505.31	17209.77
AE	4.29	4.56	-0.27	3.51	3.84	-0.33
Hectarage	0.57	0.83	-0.26	0.51	0.60	-0.09
Time	26.97	39.30	-12.33	14.46	22.00	-7.54
Rainfall	814.37	847.55	-33.17	807.55	831.70	-24.15
Wages	228.75	370.00	-141.25	341.30	290.00	51.30
Road_KM	10.02	13.49	-3.47	7.51	7.17	0.35
BOMA_KM	35.28	41.11	-5.82	24.37	36.72	-12.35
Boarder_KM	24.00	49.62	-25.62*	33.93	41.72	-7.79
Maize_Price	53.98	54.62	-0.64	65.61	53.28	12.33*
Fertilizer_Price	97.24	77.12	20.12	106.25	59.84	46.41*
Warmsemiarid	0.28	0.55	-0.26	0.29	0.60	-0.31
Warmsubhumid	0.63	0.09	0.53***	0.64	0.10	0.54***
Coolsemiarid	0.09	0.27	-0.18	0.07	0.20	-0.13
Coolsubhumid	0.00	0.09	-0.09	0.00	0.10	-0.10
North	0.00	0.00	0.00	0.00	0.00	0.00
Central	0.13	0.91	-0.78***	0.07	0.80	-0.73***
South	0.88	0.09	0.78***	0.93	0.20	0.73***
2010	0.69	0.55	0.14	0.29	0.50	-0.21
2013	0.31	0.45	-0.14	0.71	0.50	0.21
Observations	32	11	43	28	10	38

Table D.13: Differences in individual characteristics by FISP

	Female: Patrilocal			Female: Matrilocal			Male: Patrilocal			Male: Matrilocal		
	FISP	None	diff	FISP	None	diff	FISP	None	diff	FISP	None	diff
Decision	0.25	0.33	-0.08	0.46	0.57	-0.11	0.86	0.67	0.19	0.80	0.56	0.24
Ganyu [a]	0.22	0.25	-0.03	0.08	0.04	0.04	0.09	0.20	-0.11	0.22	0.21	0.00
Ganyu hrs	1.33	2.50	-1.17	1.39	0.25	1.14	0.91	0.80	0.11	2.94	2.79	0.15
Own farm hrs	8.33	14.42	-6.08	12.43	8.92	3.51	8.36	7.50	0.86	13.13	6.36	6.77
Job hrs	0.00	0.00	0.00	0.56	1.67	-1.11	9.45	5.40	4.05	9.97	10.89	-0.92
Water hrs	0.78	0.62	0.16	0.79	0.54	0.25	0.18	0.00	0.18	0.00	0.11	-0.11*
Firewood hrs	0.28	0.75	-0.47	0.22	0.46	-0.24	0.09	0.20	-0.11	0.02	0.21	-0.20
Age	42.67	38.58	4.08	32.56	26.08	6.47*	44.55	42.00	2.55	39.97	31.07	8.90**
Educated	0.56	0.42	0.14	0.78	0.79	-0.01	0.91	0.90	0.01	0.88	0.86	0.02
Observations	9	12	21	36	24	60	11	10	21	32	28	60

[a] Weekly participation

Table D.14: Differences in individual characteristics by gender

	FISP: Patrilocal			FISP: Matrilocal			Non-FISP: Patrilocal			Non-FISP: Matrilocal		
	Male	Female	diff	Male	Female	diff	Male	Female	diff	Male	Female	diff
Decision	0.86	0.25	0.61	0.80	0.46	0.34	0.67	0.33	0.33	0.56	0.57	-0.02
Ganyu [a]	0.09	0.22	-0.13	0.22	0.08	0.14	0.20	0.25	-0.05	0.21	0.04	0.17
Ganyu hrs	0.91	1.33	-0.42	2.94	1.39	1.55	0.80	2.50	-1.70	2.79	0.25	2.54
Own farm hrs	8.36	8.33	0.03	13.13	12.43	0.69	7.50	14.42	-6.92	6.36	8.92	-2.56
Job hrs	9.45	0.00	9.45	9.97	0.56	9.41**	5.40	0.00	5.40	10.89	1.67	9.23*
Water hrs	0.18	0.78	-0.60*	0.00	0.79	-0.79***	0.00	0.62	-0.62*	0.11	0.54	-0.43***
Firewood hrs	0.09	0.28	-0.19	0.02	0.22	-0.21**	0.20	0.75	-0.55	0.21	0.46	-0.24
Age	44.55	42.67	1.88	39.97	32.56	7.41*	42.00	38.58	3.42	31.07	26.08	4.99*
Educated	0.91	0.56	0.35	0.88	0.78	0.10	0.90	0.42	0.48*	0.86	0.79	0.07
Observations	11	9	20	32	36	68	10	12	22	28	24	52

[a] weekly participation