Unintended consequences of farm input subsidies: women's contraceptive usage and knock-on effects on children

Mwale, Martin Limbikani

University of Stellenbosch

10 April 2022

Unintended consequences of farm input subsidies: women's contraceptive usage and knock-on effects on children

Martin Limbikani Mwale*

*Department of Economics, University of Stellenbosch, Cape Town, South Africa

April 9, 2022

Abstract

Sub-Saharan Africa's countries adopted farm input subsidies, with a twin goal of bolstering food security and reducing poverty. Many scholars evaluate the subsidies against these intended impacts, while ignoring the potential unintended consequences. In this paper, I take advantage of a rare combination of information on both contraceptive usage and a subsidy program, from Malawi's 2020 Multiple Indicator Cluster Survey (MICS), to investigate whether Malawi's Farm Input Subsidy Program (FISP) affected women's contraceptive usage. I find that women that lived in FISP households increased contraceptives usage. This is in line with the hypothesis that the women aimed to prevent pregnancy, and hence dedicate uninterrupted time to farming, complementing the FISP. More of women's time in farming could imply less of their time in domestic chores. I therefore further investigated whether children, in the same households, increased participation in the domestic chores, to take up roles left by the farming women. I find that this is the case. These findings therefore suggest that past studies evaluating the subsidies, and failed to consider the unintended consequences on fertility choices and domestic child labour, may have over- or underestimated the benefits of the subsidies.

Keywords: Women; Contraceptive Usage; Children; Domestic Chores; Subsidies; Malawi
JEL Classifications: C54; D04; I38; Q120

Disclosure: The author has no conflicts of interests to declare

***Corresponding author:** All correspondences can be addressed to (martinresearch4@gmail.com)

1 Introduction

Sub-Saharan Africa's (SSA) food productivity lags behind the rest of the world (Rakotoarisoa et al., 2011), mainly due to the low uptake of hybrid agriculture production inputs (Mwaniki, 2006). Reasons for the low uptake of the inputs in the region include: an increased risk of investing in agriculture technology due to unreliable climatic conditions such as droughts (Ngcamu and Chari, 2020); low farm input to output response rates due to soil degradation (Vlek et al., 2010); and inaccessibility of the inputs due to farmers' liquidity constraints (Holden, 2018) and high market prices for the inputs (Sheahan and Barrett, 2017). Because of these constraints, farmers' private costs of adopting the hybrid inputs outweigh their benefits, implying a *market failure* in food productivity (Holden, 2019). To partly overcome the market failure, through increasing input use, SSA policy-makers subsidise agriculture input purchases (Jayne et al., 2013; Jayne and Rashid, 2013).

The SSA's agricultural input subsidy programs are touted to achieve a twin goal of increased food security and reduced poverty (Lunduka et al., 2013), primarily through increasing fertiliser usage among the smallholder farmers (Harou, 2018), who also form the bulk of the SSA's food producers (Diao et al., 2007). Most evaluations (see a systematic review by Jayne et al. (2018)) on the SSA's subsidies examine the impacts of the programs on the intended outcomes, and confirm that the subsidies achieve their household-level goals. For instance, cereal productivity (Karamba and Winters, 2015), household income (Sibande et al., 2017), and child nutrition (Harou, 2018) increase, due to the subsidies.

The household-level unintended consequences of the programs are however examined by only a handful of empirical studies. For instance, Ricker-Gilbert (2014) found that in Malawi an agriculture inputs subsidy program reduced household participation in casual labour - a form of seasonal employment in other people's farms that has precarious working conditions especially for women (Bryceson, 2006). He attributed this change to farmers' move towards investing more labour-time in their own farms, to complement the subsidised fertiliser. In addition, Mwale et al. (2021a), used data from the same country, and found that the reduction in casual labour supply was specific to women. The women also lost decision-making power on income from maize sales when their households received the subsidies (Mwale et al., 2021a). The outcomes of these two studies (Mwale et al., 2021a; Ricker-Gilbert, 2014) illuminated how a generic and neutral agriculture policy led to specific-unintended impacts.

Another, yet to be investigated, unintended outcome that could be related to subsidies, because it associates with labour supply, is contraceptive usage (Yaya et al., 2018). Particularly, because farm input subsidies increase marginal products of labour in own farms (Ricker-Gilbert, 2014), and target food crops whose main producers are women (Karamba and Winters, 2015), households could increase the uptake of birth control measures, to ensure that women dedicate more time to household farming, than *in utero* child care duties. However, increased adult time on household farms, especially for women, implies letting go of some household chores. Traditionally, children are the possible candidates to take over the household chores left by women, especially in most low-income countries (Putnick and Bornstein, 2016). Therefore, the knock-on effects of the possible subsidy-induced changes in women's labour patterns on children's participation in domestic chores, also need to be explored.

While, in the past, the effects of the subsidies on children's participation in household chores were possible to estimate, despite no efforts to do so being made, the effects of the subsidies on contraceptive use could only be speculated. This is because information on fertility (choices and unmet needs) and the subsidies, were collected in different surveys, with independent samples that can not be linked. Questions on fertility were found in health surveys, For instance, the Demographic and Health Surveys (DHS) or Multiple Indicator Cluster Surveys (MICS), while agriculture surveys such as the Living Standards Measurement Study for Integrated Surveys on Agriculture (LSMS-ISA) captured information about the farm input subsidies. However, the 2020 MICS for Malawi has captured both sets of information in a single survey. The data in

this survey therefore create a rare opportunity to study the effects of the subsidies on women's contraceptive use, and the *knock-on effects* on children's participation in household chores due to the possible changes in women's labour as a result.

In this paper, I take advantage of Malawi's MICS 2020 to extend the lean literature on unintended consequences of farm input subsidies. I specifically investigate whether the programs affect women's contraceptive usage, and the secondary effects of this on children's participation in domestic chores. On one hand, understanding factors that alter contraceptive use among women remains critical. This is because the use of contraceptives enables reduction in fertility (Sánchez-Páez and Ortega, 2018), which has several proven benefits to women. For instance, low fertility increases women's participation in the labour market (John et al., 2020), thereby increasing the women's household bargaining power (Dasgupta, 2000). Contraceptive usage also assists women to prevent unplanned pregnancy and abortion that could negatively affect their health (Singh et al., 2017). On the other hand, understanding the second-round effects on domestic child labour participation is also critical, because children's time used on domestic chores competes with the time spent on their education, leading to poor education outcomes (Assaad et al., 2010).

I find that women between the ages of 15 to 49, who are living in households that received the Malawi Farm Input Subsidy Program (FISP) vouchers, have a statistically significant higher probability of using a contraceptive method than similar women whose household did not receive the FISP vouchers. Limiting my sample to women who lived in households where there was at least a child between the ages of 5 and 17, the results remain consistent with those of the full sample. This sample limitation allowed for understanding the knock-on effects of FISP, through the women, on domestic labour participation for the children. I found that children (both boys and girls) between the ages of 5 and 17, a bracket containing primary and secondary school-going ages in Malawi (Al-Samarrai and Zaman, 2007), increase their probability to undertake household chores, such as fetching water and firewood, when their households received the FISP vouchers. The analysis used instrumental variables to account for the possible estimation bias, which could have been caused by non-random selection of beneficiaries into the FISP program.

This paper adds to a nascent literature on the unintended consequences of SSA's farm input subsidies. While Mwale et al. (2021a) show that the subsidies do not benefit women, and even go as far as reducing women's short-run household decision-making power over earnings from maize sales, I show that the subsidies may also benefit the women. The benefits are through contraceptive usage. Contraceptive usage has the potential to increase women's long-run household bargain, through reduced fertility (Oreffice, 2007), and hence increase their decision-making power inside their households. This possibility also throws an open question for future research, about the net household bargaining effects of the subsidies on women. Thus women's short-run losses to their bargain-through reduction in decision making power as shown by Mwale et al. (2021a), must be assessed against their long-run gains on the same-through empowering effects of fertility management found by Dasgupta (2000).

The paper also speaks to literature on the effects of farm inputs subsidies on child labour. While Dwibedi and Chaudhuri (2014) used simulations to show that the subsidies fail to reduce child labour on household farms, I empirically show that the subsidies increase domestic child labour. Because most evaluations that link agricultural interventions to child labour centre on the use of children on household farms or off-household work, typically ignoring child use in domestic chores, this paper opens up another avenue for future research. Classical questions in this avenue are: 1) whether the subsidies have secondary effects on children's schooling outcomes? 2) whether the effects are positive or negative, since such interventions can either generate income, and hence finance schooling (Chikhungu et al., 2020), or increase child labour, and hence distract schooling (Ray and Lancaster, 2003).

2 Conceptual framework

The impacts of farm input subsidies on women's contraceptive usage, and the second-round effects of the subsidies on children's participation in household chores, can be conceptualised around the possible *income* and *substitution* effects that the subsidies could induce on household welfare. Because the subsidies make fertiliser affordable, beneficiaries can now save on income that was used for purchasing commercial fertiliser (Mason and Ricker-Gilbert, 2013). Furthermore, the beneficiaries expect bumper yields during harvest, due to intensified use of fertiliser and hybrid seed, made possible by the subsidies (Karamba and Winters, 2015). These high yields can also enhance household income through the sale of surplus maize in the market and saving on income that would have been used to purchase food during the lean season (Sibande et al., 2017). Therefore, the subsidies could induce both instantaneous and future expected income effects. Aware of these possible outcomes, beneficiary households may see having an additional child more affordable due to the subsidies, hence abandon contraceptive usage. Concerning child participation in household chores, the beneficiary households can also afford employing a domestic worker, who could assist in performing household chores instead of using their own children.

The alternative is that the subsidies could induce substitution effects. Particularly, because of the intensified use of fertiliser, and thus an increase in land productivity, the subsidies could increase the marginal product of labour on the farmers' own plots (Ricker-Gilbert, 2014). This makes production on their own plots, as opposed to working outside home for wages or inside home in other household chores, more attractive. Therefore, women, who are the primary food producers in developing countries (Walker, 1988), become likely to dedicate more time to their household's farms once their households receive the subsidies. The women's labour could therefore complement the inputs investments, to increase crop productivity (Karamba and Winters, 2015). Because prenatal health management also demands labour time (Daniele, 2021) that would otherwise be used in farming, contraceptive usage could be an option to manage fertility, and as a result, intensify farm labour provision (Schultz, 1990). The women therefore have to use the time they could otherwise use in prenatal demands, for farm production. Concerning children, it is possible that women's intensified labour in farms leads households to allocate household chores, initially executed by the women, to children (Susanli et al., 2016).

Whether farm input subsidies affect women and children through the income or substitution effects therefore remains an empirical question. I answer this question using Malawi as a case study. Malawi established its Farm Input Subsidy Program (FISP) in 2006, in response to severe food shortage and rising poverty, that intensified in the country (Messina et al., 2017). The objective of FISP was to enhance food security through self-sustenance, and reduce poverty through income growth (Jayne et al., 2018). Beneficiaries of the FISP were poor subsistence farmers that could not afford market-priced inputs, but stood to benefit the most were they to obtain the inputs (Harou, 2018). One person per household was allowed to benefit, and often this beneficiary was the household head. The FISP package comprised 4 vouchers: two vouchers could be used to redeem two 50kg bags of maize fertiliser (one for basal dressing and another for top dressing), at 8 percent of the market price; the other two vouchers could be used to redeemed hybrid maize seed. Because Malawian farming is predominantly rural, the FISP mostly targeted rural areas, where poverty is rampant (Ellis et al., 2003; Fisher, 2004).

Empirical evidence reveals that the FISP increased maize productivity (Karamba and Winters, 2015), and hence household income (Sibande et al., 2017). While these welfare improvements make bearing children more affordable to the FISP recipients, the recipients may need to hire casual labourers on their farms, as substitutes for the household labour that is now dedicated to prenatal care. However, casual labour is needed the most during the rainy season, when its price is highest due to high demand (Ricker-Gilbert, 2014). Therefore, casual labour is arguably not affordable, even to households that benefit from the FISP. Concerning domestic work, FISP households that relieve household members of these tasks may need to

employ domestic workers. However, this could not be feasible, for most rural households, due to a high minimum wage (by Malawian cost of living standards) - Malawian domestic workers earn a minimum of K38000 - equivalent to 47 US dollars per month[1]). Therefore, it is more likely that in Malawi, the substitution effects of farm input subsidies outweigh the income effects. Thus, FISP women more likely increase usage of contraceptive, while children likely increase participation in domestic chores. I test this hypothesis using data described in the section that follows.

3 Data

3.1 Context and the sample

Using data from Malawi, I empirically examine the effects of farm input subsidies on women's contraceptive usage, and the secondary effects on child participation in household chores. The country is a compelling case to study the topic on several grounds. First, the unmet need for fertility is high in Malawi, such that 41 percent of pregnancies in the country are unintended (Bornstein et al., 2021). Unsurprisingly, Malawi has one of the highest population densities in SSA, due to its high Total Fertility Rate (TFR). For instance, in 2016 Malawi had a TFR of 4.2, against that of 2.6 for South Africa, 3.9 for Kenya, and 4.1 for Gabon (Forty et al., 2021), countries that are more than twice the total land area of Malawi. Because of the rapid population growth, the fight against poverty has therefore been difficult (House and Zimalirana, 1992), leaving the country as one of poorest in the world. Understanding factors that affect contraceptive usage is therefore key for countries like Malawi, to enhance fertility management, and hence, curtail the impoverishing rapid population growth (Wietzke, 2020).

Second, Malawi pioneered the SSA adoption of a targeted agriculture input subsidies program through its Farm Input Subsidy Program (FISP) (Mwale et al., 2021b). The Malawi FISP has proven impacts that could change recipient households' labour arrangements. For instance, the FISP increases maize productivity (Kanyamuka et al., 2022). This bolsters the marginal product of labour invested in household farms, in which the subsidised inputs are applied. Considering that in Malawi, just as is in most SSA countries, women undertake most food production (Boserup, 1985), the FISP could compel them to adopt contraceptive methods. Contraceptives would enable the women to manage fertility, and thus dedicate more time to food production. Women's dedication of more time on the farm could also imply their reduced participation in domestic chores, such as fetching water and firewood. Women dominate such duties in most low-income countries (Sikod, 2007). Particularly in Malawi, women and children execute these duties (Sankhulani, 2007).

The Malawi's 2020 Multiple Indicator Cluster Survey (MICS)[2] becomes an ideal data set that could assist in answering this paper's research question - unintended consequences of farm input subsidies: women's contraceptive usage and knock-on effects on children, because it has all the key outcomes and treatment for the topic. The MICS are a series of surveys conducted to monitor the situation of women and children in several countries across the globe. The United Nations Children's Fund (UNICEF) provides technical support for the implementation of the MICS, while the host governments lead the process of data collection and management for the MICS surveys.

The Malawi 2020 MICS was a two-stage stratified random sample, the first stage being clusters and the second, households, that interviewed 24,543 women between the ages of 15 and 49, and 17,824 between the ages of 5 and 17, who resided in 25,419 households. Because most adult women are married, they could be facing different influences on their contraceptive usage due to their husbands, as compared to those that are below the legal marriage age of 18, who are more likely unmarried. I therefore limited the estimation

[1] www.alrei.org

[2] found on www.mics.unicef.org/surveys

sample to adult women. This implied including only women who are between the ages of 18 and 49, while excluding women between the ages of 15 and 17. Moreover, this distinction was important because it excluded the potential endogenous influence of women (between the ages of 15 and 17 years) who could be simultaneously eligible for the main effects of FISP on contraceptive usage and the knock-on effects on the demand for domestic child labour.

Just as the previous MICS, and the MICS in other countries, the Malawi 2020 MICS asked questions on women's contraceptive usage, and children's household labour demands, including whether the children participated in fetching water and firewood for their households in the last week preceding the survey. However, unlike the previous MICS, and the MICS in other countries, Malawi's 2020 MICS had a special feature. It included a question on whether a household received vouchers from FISP during the current agriculture season.

The inclusion of the FISP question allows examining impacts of the program on outcomes that have not been examined before in the subsidies literature. One of these impacts is the effects of subsidies on contraceptive use, that I examine in this paper. However, because the question about FISP was asked of farming households only, I further limited the sample for my analysis, to the farming households. This limit implies that most urban households who often are non-eligible for the FISP were dropped. My final sample therefore was 17,978 women and 14,155 children.

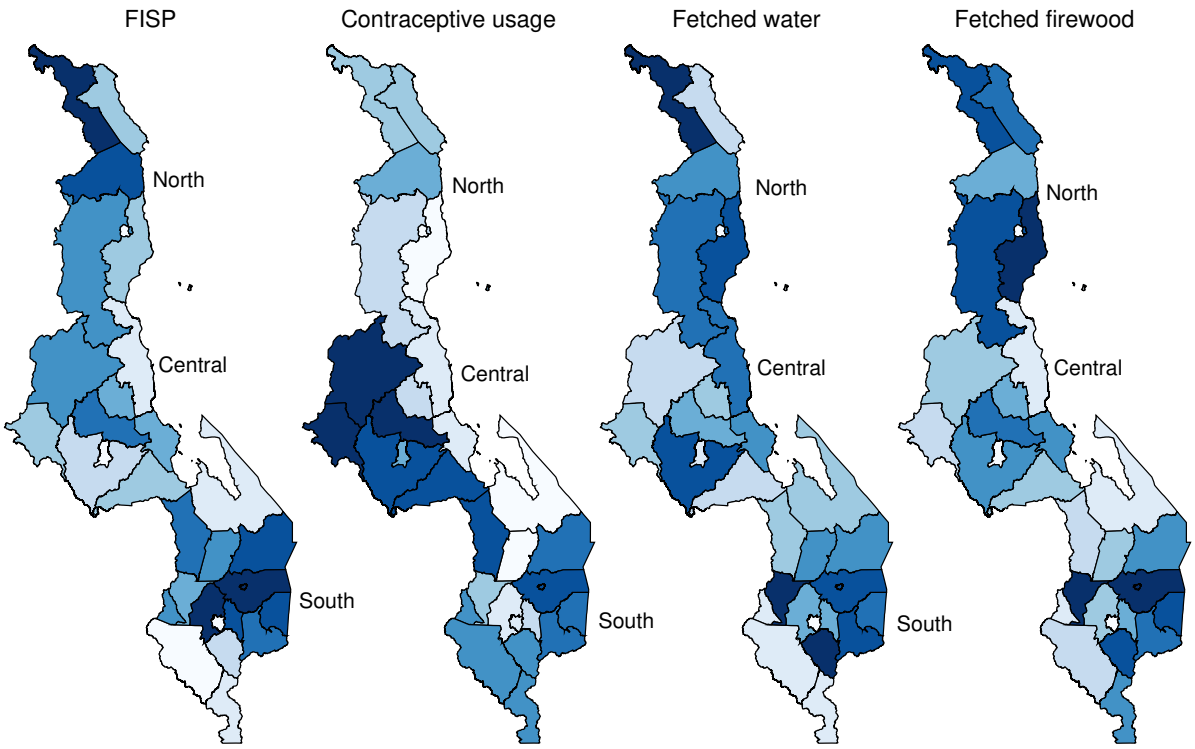
These women and children were also asked in the survey to provide their ages, education levels, marital status, number of living children they have given birth to (asked of women only), the amount of land that their households owns, the gender of their household head, and their region of residence, among the many other attributes. I use the responses to these questions as control variables for my estimations in the analysis. In Tables A.1 and A.2 of Appendix A, I provide the means, standard deviations, minimum values and maximum values for all the variables used for the women's and children's analyses respectively.

3.2 Descriptive statistics

Figure 1 presents a spatial distribution of FISP among households, contraceptive usage among women, and children's participation in fetching water and firewood for their households, across districts in Malawi. All the panels represent proportions and the depth of the colour reveals increased concentration of the measured attribute. The panels also show regional distribution of the districts. In the first panel the northern and southern region districts had the highest proportion of FISP beneficiaries, relative to the central region. Because, during Malawi's 2019 general elections, the ruling party won many votes in the southern region, followed by the northern region, and lastly the central region, the FISP distribution patterns in the first panel of Figure 1 confirm what Chinsinga and Poulton (2014) found. These authors show that the Government of Malawi (GoM) allocated the most FISP vouchers to areas that voted for the ruling party in the most recent general elections. Banful (2011) found similar evidence for the farm input subsidy programs in Zambia, Tanzania, Nigeria and Ghana.

The second panel in Figure 1, shows that contraceptive usage is high among women of the central region, followed by women in the southern region, and lastly the women of the northern region. Relating to the first panel of FISP, the second panel suggests that FISP is positively associated with contraceptive usage in the southern region, while other factors independent of FISP drive contraceptive usage in the central region. For instance, because the central region holds the most fertile arable land in the country (Munthali et al., 2019), and thus larger labour productivity, contraceptive usage could be high, to allow women to dedicate more efforts on the farm. The lack of association between FISP and contraceptive usage in the northern region, could confirm what Forty et al. (2021) argues that, due to patriarchal traditions dominant in the north, men restrain women from using the contraceptives. Moreover, the northern region has the highest rate of delayed marriages, due to high education attainment Baruwa et al. (2020). Delayed marriages reduce

Figure 1: The percentage distribution of outcomes and treatment across Malawi



Source: Own calculation from Malawi MICS 2020, using Malawi shape files - accessed at www.data.world.ocha-rosea.

total fertility, and hence reduce the need for post-marital birth control (Forty et al., 2021).

The third and fourth panels show that children in the northern and the southern regions participate more in fetching water and firewood for their households, that children of the central region do. While the children's domestic chores participation in the southern region suggest presence of the second-round impacts of the association between FISP and women's contraceptive usage, the northern region's high FISP concentration and high child participation in domestic chores, under low women's contraceptive usage, could be suggest that with or without a contraceptive usage changes, FISP women provide more labour to their farms. Arguably, children are then required to take over domestic chores left by the women. The possible women's double burden of fertility and farming due to FISP is not surprising in the northern region of Malawi. Women of this region hold low bargaining power, orchestrated by the dominant patrilineal traditions, that disproportionately empower men (Behrman, 2017).

The heterogeneity in the regional distribution of our key variables in Figure 1 justify inclusion of regional dummies, as part of the control variables in the analysis. Particularly, because the heterogeneity is higher in the spatial distribution of contraceptive usage than children's domestic labour patterns, it is possible that the association between FISP and contraceptive adoption can only be observed if important characteristics such as regional dummies are controlled for. The case may not be the same for the relationship between the FISP and children's participation in domestic chores. I confirm this in Table 1 that follows.

In Table 1, I present differences in means between women and children from FISP households against those of women and children from non-FISP households. From Columns 1 to 3, I compare women between the ages of 15 and 49. Because these are uni-variate associations, the means confirm that without controlling for other attributes, contraceptive usage between FISP and non-FISP women is not statistically different.

Table 1: Differences in means by FISP

	All women			Women with 5-17 yr old children			Children 5-17 years old		
	FISP	Non-FISP	t-test	FISP	Non-FISP	t-test	FISP	Non-FISP	t-test
Contraceptive	0.628	0.603	0.025	0.621	0.606	0.015			
Water							0.696	0.627	0.069***
Firewood							0.266	0.203	0.063***
Female							0.520	0.521	-0.001**
Age	31.907	29.753	2.154***	33.080	31.520	1.56***	10.365	10.098	0.267***
Uneducated	0.093	0.098	-0.005	0.098	0.112	-0.014**	0.847	0.829	0.018***
Primary education	0.683	0.588	0.095***	0.689	0.590	0.099***	0.031	0.035	-0.004*
Secondary education	0.217	0.270	-0.049***	0.207	0.257	-0.046***	0.012	0.018	-0.008***
Post secondary education	0.007	0.044	-0.037***	0.007	0.041	-0.034***			
Married	0.692	0.695	-0.003	0.680	0.675	0.005			
Number of children alive	3.123	2.627	0.496***	3.421	3.055	0.366***			
Land holding	1.069	0.798	0.271***	1.046	0.780	0.266***	1.053	0.810	0.243**
Male headed household	0.679	0.669	0.010*	0.673	0.660	0.013***	0.676	0.671	0.005**
Age of head	41.592	37.868	3.724***	42.703	40.313	2.390***	43.035	39.912	3.123***
Northern region	0.129	0.105	0.024**	0.133	0.104	0.029***	0.125	0.099	0.026***
Central region	0.412	0.498	-0.086***	0.401	0.490	-0.089***	0.404	0.495	-0.091***
Southern region	0.459	0.397	0.062***	0.466	0.406	0.060***	0.472	0.407	0.065***

However, FISP women are older and less educated, than non-FISP women. The FISP women also have more children alive, their households hold larger lands, are more male headed, have older household heads, and dominate the southern region, in comparison to non-FISP women.

In columns 4 to 6 of Table 1, I limit the sample of women to those who were living in households containing at least one child who is between the ages of 5 and 17. This is to ensure that the children's FISP-related changes in domestic chores participation are interpreted against the contraceptive usage of women inside the same household. The patterns of the statistics in Columns 4 to 6 are similar to those of the full sample, with only minor differences in mean sizes. This suggests that estimating the effects of FISP on contraceptive usage for these two samples could yield qualitatively similar results.

In columns 7 to 9 of Table 1, I present the differences in means between children of ages from 5 to 17, who are living in FISP households and children of a similar age group but living in non-FISP households. Participation in fetching water and firewood is higher among FISP children than non FISP children, confirming the spatial evidence of less heterogeneity in domestic child labour participation observed in Figure 1. The outcome also suggests that FISP could indeed have a positive secondary association with domestic child labour participation. There are more female children in FISP households than non-FISP households, which could also explain the high use of children in undertaking household chores, since traditional norms in Malawi often allocate these household chores to girls (Biran et al., 2004). I confirm this in Table A.3 of Appendix A where I split the children's sample into male and female, and show that the magnitude of participation in domestic chores is higher for the girls relative that of the boys. This also warrants estimating the relationship between FISP and fetching water and firewood for female and males separately. Nevertheless, Table A.3 of Appendix A also shows that FISP associates with a higher absolute uptake of domestic chores among both girls and boys. It therefore, is possible that controlling for necessary attributes in a multivariate case, removes the gender difference, while maintaining the effects of FISP on each gender's uptake of domestic chores in general.

In columns 7 to 9 of Table 1, I show that children in FISP household are in lower levels of education relative to children in non-FISP households. As expected, the patterns of household characteristics between FISP and non-FISP children is the same as that observed for women between FISP and non-FISP house-

holds.[3] This solidifies my hypothesis that the effects of FISP on children's household chores that I observe, are impulse responses from women's changes in labour allocation due to the FISP, because these two groups are from the same households.

I empirically test the associations observed here, by employing econometric methods that I describe in the section that follows, to establish the empirical link between FISP and women's contraceptive usage, and that between FISP and boys' and girls' participation in fetching water and firewood.

4 Methodology

4.1 Empirical strategy

The empirical application of my research question demands modelling women's contraceptive usage and domestic child labour participation as a function of their household's participation in FISP. I therefore built econometric models that can be captured by the following equation:

$$Y_{ijr} = \beta_1 FISP_{ijr} + \boldsymbol{\lambda}' \boldsymbol{x}_{ijr} + \mu_j + \varepsilon_{ijr} \tag{1}$$

In Equation 1, Y_{ijr} is a categorical outcome variable, where 1 denotes a woman's contraceptive usage or a child's participation in fetching water or firewood, and 0 otherwise. The woman or the child are individuals i, residing in household j, that is in region r. $FISP$ is categorical where households that received the program's vouchers in the year 2019 are denoted by 1, while households that did not receive are denoted by 0. β_1 captures the effects of FISP on the stated Y_{ijr} outcomes. $\boldsymbol{x}_{ijr}$ is a vector of control variables at individual level (age, education, marital status, and number of living children one has given birth to), household level (landholding in hectares, gender of household head, and age of household head), and regional level (central region and southern dummies, with northern region as the omitted reference group.)[4].

Equation 1 contains a composite error term, $\mu_r + \varepsilon_{ijr}$. The first component is μ_j which is systematic across households, while the second component is idiosyncratic - assumed independent and identically distributed. If one takes a conditional mean of Equation 1, the idiosyncratic error term collapses to zero, while the systematic error term does not collapse to zero. This implies that without taking care of the μ_j, results from estimating the relation between FISP and Y_{ijr} are biased.

For practical purposes a non-zero mean for μ_j could result from non-random selection of beneficiaries into the FISP. For instance, it is possible that households that accept the FISP vouchers are risk perverse. They are not scared to make the necessary payments to redeem agriculture inputs using the FISP vouchers, despite not being certain about the availability of good rains throughout the growing season. Good rains would enable crops to grow, and hence prevent waste of the resources used in procuring the inputs. The same high taste for risk could influence women in these households to neglect contraceptive usage, hence facing the possibility of untimely pregnancy, or even unsafe abortion.

It is also possible that beneficiary households have individuals with high innate ability, hence, are highly productive farmers. They are therefore attractive candidates to receive the FISP (Basurto et al., 2020). The high ability, and hence a high marginal product of labour, would also motivate these individuals to spend much time on the farms, where they have a comparative advantage, even when their household does not receive the FISP. Women living in such households would therefore be more inclined to work on the farm, and hence relegating some domestic chores to children, with or without the FISP.

These two scenarios, one for contraceptive usage and the other for domestic child labour use, imply that a third factor - risk aversion and innate ability, could bias our results if estimated using Ordinary Least

[3] I do not find children between the ages of 5 and 17, who are in post-secondary education.

[4] I present the definitions and summary statistics for the control variables in Tables A.1 and A.2 of Appendix A

Squares (OLS). This is because the OLS technique does not control for unobservable factors that could bias estimates (Horrace and Oaxaca, 2006). However, the Instrumental Variables (IV) technique accounts for the unobserved factors, which OLS fails to consider (Gennetian et al., 2008). Therefore, I used the IV technique to identify the effects of FISP on women's contraceptive usage and children's participation in fetching water or firewood for their households.

4.2 Identification

Estimation using an IV technique involves two stages. In the first stage, one estimates factors that determine the treatment, in this case factors that affect participation in the FISP. In this stage, the factors include an instrumental variable, that is exogenous, and shifts the treatment variable. Predicted values of the treatment variables (FISP) are then obtained and used in place of the observed value of the treatment in a second stage. The second stage estimates factors that affect the outcome variables, in this case contraceptive usage or child participation in fetching water or firewood, on the control variables, while including the predicted values of the treatment variable, FISP, but excluding the instrument.

However, estimating causal evidence using the instrumental variables technique relies on identifying the instrumental that meets two assumptions. First, the variable needs to affect the outcome only through the treatment-*instrument validity*, and second, the variable must significantly shift the treatment in the desired direction-*instrument relevance* (Castineira and Nunes, 1999). I selected two of these variables, which for the remaining part of the paper, I will also call IVs or instruments. The first instrument was the proportion of district votes won by the ruling party, the Democratic Progressive Party (DPP), in the 2019 general elections. As confirmed in Figure 1, areas that voted for the ruling party in the most recent general elections received a large number of FISP vouchers. Harou (2018) uses a similar instrument in Malawi, to examine the effects of the FISP on dietary diversity and child nutrition, while Mason and Ricker-Gilbert (2013) use the instrument in Malawi and Zambia to examine the effects of the FISP on the demand for commercial seeds.

Because the voting outcomes would lead to an increase in access to FISP vouchers within a district without considerations of factors such as risk aversion and ability, the unbiased effects of FISP can identified. Therefore, the instrument validity assumption is justified. A threat to this identification for the case of contraceptive usage would be when the voting patterns also affect the supply side of contraceptives. However, characteristic of most low-income countries (Jacobstein et al., 2013), in Malawi, health programs such as contraceptive resources and campaigns are funded by development partners (Jacobstein, 2013). The development partners often have no interest to politically distribute resources for health programs, as is the case with the government-funded and controlled FISP. I therefore have no reason to believe that the supply of contraceptives is endogenous to the voting patterns IV.

My second instrument was the number of FISP vouchers distributed in a district, minus a household's own vouchers. A similar instrument was also used in Malawi by Harou (2018). At district level FISP vouchers were also distributed by area under maize cultivation. Districts that had more land dedicated to maize growing received more vouchers than their counterparts (Kilic et al., 2015). However in Malawi, maize coverage also reflects climatic suitability to maize growing (Thornton et al., 1995), which is often independent of household or individual level attributes such as risk aversion or farming ability. This entails that other households availed into the FISP simply because their resident districts had a large concentration of FISP vouchers, not necessarily availing into the FISP due to their systematic and inherent characteristics. Moreover, because I exclude the household's own vouchers when computing the district proportion, I prevent the household's own attributes from contributing to its beneficiary status. Therefore, instrument validity is justified.

A threat to the identification using the proportion of district vouchers minus one's own, is when more

eligible farmers migrate into these maize-suitable areas to take advantage of the increased voucher concentrations. However, this is an unlike case in Malawi, because the most land is held under customary law, and accessed through inter-generational inheritance (Berge et al., 2014). Therefore, migration leads to loss of land. Moreover, FISP requires that beneficiary households are permanent residents of their villages, and they have land for cultivation (Kilic et al., 2015). Therefore, migration would lead to loss of eligibility for the FISP.

While one can only argue, as I have done, about the validity of the chosen instruments, the relevance of instruments can be tested. In Table D.6 of D, I show factors that affect selection into FISP, and include the instruments as part of the covariates. Both instruments increase the probability of a household participating in FISP at $p < 0.001$ level of significance. This provides preliminary evidence that the chosen instruments are relevant. I formally tested, and confirmed, the relevance in each outcome model, estimated using Equation 1, by ensuring that the first-stage statistics of the instruments are above the threshold of 10. The first-stage statistics are included in the main results that I present in the section that follows this one.

5 Results

Table 2: The effects of FISP on women's contraceptive usage, and their second-round effects on child labour

	(1)	(2)	(3)	(4)	(5)	(6)
	Women		Boys		Girls	
	Contraceptive usage		Water	Firewood	Water	Firewood
			OLS results			
FISP (Living in a beneficiary household)	0.031***	0.017*	0.038**	0.022*	0.081***	0.086***
	(0.009)	(0.010)	(0.017)	(0.012)	(0.012)	(0.015)
Constant	0.526***	0.550***	0.214***	0.147***	0.470***	0.160***
	(0.033)	(0.037)	(0.041)	(0.032)	(0.029)	(0.036)
			IV results			
FISP (Living in a beneficiary household)	0.548***	0.495**	0.700***	0.383***	0.433***	0.558***
	(0.200)	(0.222)	(0.208)	(0.136)	(0.051)	(0.044)
Constant	0.492***	0.496***	0.033	0.047	0.409***	0.078*
	(0.040)	(0.050)	(0.076)	(0.052)	(0.034)	(0.041)
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes
Household controls	Yes	Yes	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17978	14185	6764	6768	7391	7390
F-statistic	29.197	22.231	36.129	36.032	560.221	562.463

NOTES: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Contraceptiveusage is discreet variable indicating whether a woman in question is currently using a contraceptive method, captured by 1), and 0) when she is not using any contraceptive method. *Water* is discreet variable indicating whether a child participated in drawing water for their household in the past week, with 1) affirmative, and 0) negative. *Firewood* is discreet variable indicating whether a child participated in fetching firewood for their household in the past week, with 1) affirmative, and 0) negative *FISP* is discreet indicating whether a household in which a woman or a child lives, participated in the FISP program in the year in question. Control variables include *Individual attributes of the people (woman or child) in question (age, education levels, marital status, for both, and additional variables, marital status and number of children one has given birth to and are alive, for women ; Household attributes (land holding, male headed household dummy, and age of the head); Regional dummies (Central and South)*
Source: Own calculations from MICS 2020 data

Table 2 presents regression results on the relationship between FISP and contraceptive usage among women, and on the relationship between FISP and child participation in fetching water and firewood. The top panel of the table are *naive* OLS estimates, only presented for robustness. The bottom panel of the table are the IV estimates, presented as the main results of the paper. The estimations included

both the FISP variable and the control variables. However, for brevity, I display only parameters for the relationship between FISP and the outcome variables. In Tables B.4 and C.5 of Appendix C, I show both the relationship between FISP and the outcome variables (women's contraceptive usage and children's participation in fetching water and firewood for their households, and the relationship between each of the control variables presented in $\boldsymbol{x}_{ijr}$ of Equation 1 and the outcome variables). Because the main results are those estimated by IV, here I only discuss the IV estimates, and use the OLS only as a reference.

Table 2 Column 1 presents results from estimating the effects of FISP on contraceptive usage that included all the women in the sample. The results show that FISP increases women's probability of using contraceptives by 55 percent. The fist-stage statistic is above the threshold of 10, confirming that the IV used in this model (proportion of ruling votes) is relevant. The IV results provide similar qualitative evidence as those observed for the OLS - both estimation techniques reveal a positive and significant relationship between FISP and women's contraceptive usage. However, the IV coefficients are larger than the OLS coefficient. Therefore, estimations that used the OLS technique under-estimated the effects of FISP on women's contraceptive usage. Again, this justifies the use of the IV technique, and importantly, the use of the IV estimates as the main results for the paper.

Table 2 Column 2 presents results from estimating the effects of FISP on contraceptive use, when the sample is limited to women who were living in a household which had at least one child in the age group between 5 and 17. The results reveal that FISP increases women's probability of using contraceptives by 50 percent. Similarly, the OLS results maintain the same direction with the IV. Furthermore, the instrument (proportion of ruling votes) remains above the threshold of 10, confirming its relevance. Because I use this limited sample of women as the basis for examining the second-round effects of FISP on children's domestic labour participation, the outcome that the women's limited sample remains positive and statistically significant justified the estimation of the second-round effects.

Table 2 Columns 3 to 6 present results from estimating the effects of FISP on children's participation in fetching water and firewood for their households. Because in Malawi, domestic labour allocation is often disproportional by gender of the child (Shimamura and Lastarria-Cornhiel, 2010), it is possible that FISP affected boys' and girls' participation in domestic chores differently. Particularly, the size of the program effects could differ by gender of the child. I therefore split the sample of children into boys and girls. The results in Column 3 show that FISP increases boys' participation in fetching water for their households by 70 percent, while Column 4 shows that the FISP increases the boys' participation in fetching firewood by 38 percent. More boys join water fetching, than the proportion of boys joining firewood fetching. And still, the instrument (proportion of ruling votes) remains relevant. Therefore, also, the OLS results under-estimated the effects of FISP on boys' participation in fetching water and firewood.

Table 2 Columns 5 and 6 present results from estimating the effects of FISP on girls' participation in fetching water and firewood for their households respectively. The IV of ruling votes became insignificant in the first stage of girls' equations. Here I therefore used the IV of the number of FISP vouchers per district minus one's own household's vouchers as the instrument. The first-stage statistic was above the threshold of 10 confirming that the IV was relevant. The results show that FISP increases the probability of girls' fetching water by 43 percent, and that of fetching firewood by 56 percent. More girls join firewood fetching than the proportion of girls joining water fetching, a pattern opposite to that observed for boys, justifying the splitting of my sample by gender of the child. As was the case with the OLS results for boys, the OLS results for girls under-estimated the effects of FISP.

6 Discussion

I establish that welfare programs aimed to bolster food security and reduce poverty, could have unintended consequences on women and children when they re-arrange incentive structures in household labour supply. Firstly, I show that women increase their usage of contraceptive methods when their household benefits from FISP. These results support the assertion that providing subsidy vouchers to a household could increase productivity (Arndt et al., 2016; Lunduka et al., 2013; Shively and Ricker-Gilbert, 2013), and thus increase women's usage of contraceptives, so that more labour time is dedicated to farming, unlike *in utero* child care duties. Spending more time on the household farm is likely to complement the subsidy inputs with adequate labour. Moreover, households that receive FISP but do not successfully increase their farm productivity, risk losing their beneficiary status in subsequent growing seasons, for being inefficient users of the subsidised inputs (Basurto et al., 2020). Therefore, increasing labour investment in the household farm, when the household receives FISP, is not only to achieve efficiency of input use, but it is also a means to safeguard the FISP beneficiary status of the women's household.

Secondly, I show that more children join the participation in household chores, when their households benefit from FISP. The results support the assertion that increased time spent on the household farm by women relegates some domestic duties that were executed by the women, to children (Putnick and Bornstein, 2016). This is a *knock-on effect* of FISP-induced changes in women's labour supply patterns on children's involvement in domestic chores. These secondary effects of women's labour changes are not new in the context of developing countries. Francavilla and Giannelli (2010) found that when Indian mothers' non-domestic labour participation increased, children took up more domestic chores. Similarly, in Malawi, Hazarika and Sarangi (2008) found that household access to micro-credit, which increased women's uptake of business ventures, increased children's participation in domestic chores.

These results have welfare implications for the women and children. Particularly, by managing fertility, the FISP induced increase in contraceptive usage could enhance women's welfare (Pezzini, 2005). Through managed fertility, women prevent unplanned pregnancies that could deteriorate their health (Peipert et al., 2012). Furthermore, the managed fertility reduces harmful abortions (Riley et al., 2020). Moreover, managed fertility, particularly reduction in fertility, increases women's labour market participation (He and Zhu, 2016). The increased labour market participation bolsters women's income, and thus improves their household bargaining power (Isran and Ali Isran, 2012). The high household bargain could also protect women from spousal abuse (Heath, 2014).

While women seem to benefit from unintended consequences of FISP through contraceptive usage, children are more likely to be on the losing side, from the secondary effects of the FISP on women's labour patterns. This is because the increased uptake of domestic chores interferes with children's education outcomes (Abou, 2016; Chinyoka and Naidu, 2014). Children who take up more domestic chores, dedicate less time to after-school academic tasks such as homework (Reich et al., 2013). In extreme circumstances, the children could be absent from school, or even completely drop out (Shahidul and Karim, 2015). The children's age group that I use in the analysis (5 to 17) contains the primary and secondary age groups in Malawi (6 to 17), which are critical foundation stages of education development. Therefore, the potential negative effects of FISP, through increased participation in domestic chores, demand the attention of development policy.

Should policy therefore support the implementation of FISP for the benefit of women through the increased contraceptive use, or reduce the scale of FISP for the sake of the children who are facing increased domestic labour participation? Perhaps the question should not be so binary, but rather, how best can policy-makers implement FISP, while limiting the possible negative impacts on children's welfare? An option is to condition the FISP to child schooling outcomes. Thus, households whose children under-perform in school due to factors such as absenteeism or inability to meet home assignments should be dropped from

the FISP beneficiary list. Conditioning a household welfare program on schooling outcomes has worked in Mexico (De Brauw and Hoddinott, 2011) and Brazil (Bastagli, 2009).

7 Conclusion

In this paper, I used 2019 data from Malawi to examine the unintended consequences of farm input subsidies on women's contraceptive usage, and the knock-on effects on children's participation in fetching water and firewood. I found that the Malawi Farm Input Subsidy Program (FISP) increased women's contraceptive usage, likely to allow the women to manage fertility, and thus dedicate more time to household farming. I also found that the FISP increased children's participation in fetching water and firewood for their households. The children likely covered for the gap left by the women in these tasks, as the women spend more time on the farms. Therefore, scaling up welfare programs like the FISP to leverage the benefits on women, should be accompanied by modalities that ensure that children's welfare, especially schooling, is not negatively affected. One possible way could be conditioning the FISP to the children's schooling outcomes.

Results from this paper have implications for future research. Firstly, due to data limitations, I do not test whether the FISP leads to a net increase in women's bargaining power, even though it is well-known that, through fertility management, contraceptive usage increases women's household bargain (Oreffice, 2007). Particularly because Mwale et al. (2021a) show that the FISP reduces women's decision-making on earnings from maize sales, this loss in agency should be checked against the possible bargain benefits of the FISP from contraceptive usage.

Secondly, I do not test the effects, the magnitude and direction of the FISP, on schooling outcomes. On one hand, it is possible that FISP-induced domestic chores participation for the children negatively affected their education outcomes. On the other hand, it is also possible that, because the FISP boosts household food security and income, the schooling children are well-fed, and education expenses are more ably paid, due to the FISP. If the income effect is larger than the substitution effects, the FISP may ultimately improve schooling outcomes. Therefore, subject to availability of FISP data that has both schooling outcomes and domestic work, future research should test the net effects of agriculture inputs subsidies on education outcomes.

Nevertheless, in its current nature, this paper provides causal evidence that agriculture welfare programs that aim to enhance food security and reduce poverty, have unintended consequences that are not envisaged in the design of the programs. These unintended consequences have implications for the welfare of different individuals inside households that, when not given adequate attention, could be welfare enhancing or depleting. Therefore, previous studies that examined the impacts of farm input subsidy programs, without accounting for their unintended consequences on women's and children's welfare, may have under- or over-estimated the intra-household benefits of the farm input subsidy programs.

References

Abou, P. E. (2016). Does domestic work affect the academic performance of girls in primary school in côte d'ivoire? empirical evidence from probit model. *European Scientific Journal*, 12(35):368–381.

Al-Samarrai, S. and Zaman, H. (2007). Abolishing school fees in malawi: The impact on education access and equity. *Education Economics*, 15(3):359–375.

Arndt, C., Pauw, K., and Thurlow, J. (2016). The economy-wide impacts and risks of malawi's farm input subsidy program. *American Journal of Agricultural Economics*, 98(3):962–980.

Assaad, R., Levison, D., and Zibani, N. (2010). The effect of domestic work on girls' schooling: Evidence from egypt. *Feminist Economics*, 16(1):79–128.

Banful, A. B. (2011). Old problems in the new solutions? politically motivated allocation of program benefits and the "new" fertilizer subsidies. *World Development*, 39(7):1166–1176.

Baruwa, O. J., Amoateng, A. Y., and Biney, E. (2020). Socio-demographic changes in age at first marriage in malawi: evidence from malawi demographic and health survey data, 1992–2016. *Journal of Biosocial Science*, 52(6):832–845.

Bastagli, F. (2009). Conditionality in public policy targeted to the poor: promoting resilience? *Social Policy and Society*, 8(1):127–140.

Basurto, M. P., Dupas, P., and Robinson, J. (2020). Decentralization and efficiency of subsidy targeting: Evidence from chiefs in rural malawi. *Journal of public economics*, 185:104047.

Behrman, J. A. (2017). Women's land ownership and participation in decision-making about reproductive health in malawi. *Population and Environment*, 38(4):327–344.

Berge, E., Kambewa, D., Munthali, A., and Wiig, H. (2014). Lineage and land reforms in malawi: Do matrilineal and patrilineal landholding systems represent a problem for land reforms in malawi? *Land Use Policy*, 41:61–69.

Biran, A., Abbot, J., and Mace, R. (2004). Families and firewood: a comparative analysis of the costs and benefits of children in firewood collection and use in two rural communities in sub-saharan africa. *Human Ecology*, 32(1):1–25.

Bornstein, M., Huber-Krum, S., Norris, A. H., and Gipson, J. D. (2021). Infertility, perceived certainty of pregnancy, and contraceptive use in malawi. *Studies in Family Planning*, 52(2):143–163.

Boserup, E. (1985). Economic and demographic interrelationships in sub-saharan africa. *Population and development review*, pages 383–397.

Bryceson, D. F. (2006). Ganyu casual labour, famine and hiv/aids in rural malawi: causality and casualty. *The Journal of Modern African Studies*, 44(2):173–202.

Castineira, B. R. and Nunes, L. C. (1999). Testing endogeneity in a regression model: An application of instrumental variable estimation. *Investigacion Operativa*, 8:197–206.

Chikhungu, L., Kadzamira, E., Chiwaula, L., and Meke, E. (2020). Tackling girls dropping out of school in malawi: Is improving household socio-economic status the solution? *International Journal of Educational Research*, 103:101578.

Chinsinga, B. and Poulton, C. (2014). Beyond technocratic debates: the significance and transience of political incentives in the malawi farm input subsidy programme (fisp). *Development Policy Review*, 32(s2):s123–s150.

Chinyoka, K. and Naidu, N. (2014). Influence of home based factors on the academic performance of girl learners from poverty stricken families: A case of zimbabwe. *Mediterranean Journal of Social Sciences*, 5(6):223.

Daniele, M. A. S. (2021). Male partner participation in maternity care and social support for childbearing women: a discussion paper. *Philosophical Transactions of the Royal Society B*, 376(1827):20200021.

Dasgupta, I. (2000). Women's employment, intra-household bargaining, and distribution: a two-sector analysis. *Oxford Economic Papers*, 52(4):723–744.

De Brauw, A. and Hoddinott, J. (2011). Must conditional cash transfer programs be conditioned to be effective? the impact of conditioning transfers on school enrollment in mexico. *Journal of development Economics*, 96(2):359–370.

Diao, X., Hazell, P. B., Resnick, D., and Thurlow, J. (2007). *The role of agriculture in development: Implications for Sub-Saharan Africa*, volume 153. Intl Food Policy Res Inst.

Dwibedi, J. K. and Chaudhuri, S. (2014). Agricultural subsidy policies fail to deal with child labour under agricultural dualism: What could be the alternative policies? *Research in Economics*, 68(3):277–291.

Ellis, F., Kutengule, M., and Nyasulu, A. (2003). Livelihoods and rural poverty reduction in malawi. *World Development*, 31(9):1495–1510.

Fisher, M. (2004). Household welfare and forest dependence in southern malawi. *Environment and Development Economics*, 9(2):135–154.

Forty, J., Rakgoasi, S. D., and Keetile, M. (2021). Patterns and determinants of modern contraceptive use and intention to usecontraceptives among malawian women of reproductive ages (15–49 years). *Contraception and reproductive medicine*, 6(1):1–12.

Francavilla, F. and Giannelli, G. C. (2010). The relation between child work and the employment of mothers in india. *International Journal of Manpower*.

Gennetian, L. A., Magnuson, K., and Morris, P. A. (2008). From statistical associations to causation: what developmentalists can learn from instrumental variables techniques coupled with experimental data. *Developmental psychology*, 44(2):381.

Harou, A. P. (2018). Unraveling the effect of targeted input subsidies on dietary diversity in household consumption and child nutrition: The case of malawi. *World Development*, 106:124–135.

Hazarika, G. and Sarangi, S. (2008). Household access to microcredit and child work in rural malawi. *World Development*, 36(5):843–859.

He, X. and Zhu, R. (2016). Fertility and female labour force participation: Causal evidence from urban c hina. *The Manchester School*, 84(5):664–674.

Heath, R. (2014). Women's access to labor market opportunities, control of household resources, and domestic violence: Evidence from bangladesh. *World Development*, 57:32–46.

Holden, S. T. (2018). Fertilizer and sustainable intensification in sub-saharan africa. *Global food security*, 18:20–26.

Holden, S. T. (2019). Economics of farm input subsidies in africa. *Annual Review of Resource Economics*, 11:501–522.

Horrace, W. C. and Oaxaca, R. L. (2006). Results on the bias and inconsistency of ordinary least squares for the linear probability model. *Economics Letters*, 90(3):321–327.

House, W. J. and Zimalirana, G. (1992). Rapid population growth and poverty generation in malawi. *The Journal of Modern African Studies*, 30(1):141–161.

Isran, S. and Ali Isran, M. (2012). Low female labour participation in pakistan: Causes and consequences. *Pakistan Journal of Social Sciences (PJSS)*, 32(2).

Jacobstein, R. (2013). Lessons from the recent rise in use of female sterilization in malawi.

Jacobstein, R., Curtis, C., Spieler, J., and Radloff, S. (2013). Meeting the need for modern contraception: effective solutions to a pressing global challenge. *International Journal of Gynecology & Obstetrics*, 121:S9–S15.

Jayne, T., Mather, D., Mason, N., and Ricker-Gilbert, J. (2013). How do fertilizer subsidy programs affect total fertilizer use in sub-saharan africa? crowding out, diversion, and benefit/cost assessments. *Agricultural economics*, 44(6):687–703.

Jayne, T. S., Mason, N. M., Burke, W. J., and Ariga, J. (2018). Taking stock of africa's second-generation agricultural input subsidy programs. *Food Policy*, 75:1–14.

Jayne, T. S. and Rashid, S. (2013). Input subsidy programs in sub-saharan africa: a synthesis of recent evidence. *Agricultural economics*, 44(6):547–562.

John, N. A., Tsui, A. O., and Roro, M. (2020). Quality of contraceptive use and women's paid work and earnings in peri-urban ethiopia. *Feminist Economics*, 26(1):23–43.

Kanyamuka, J. S., Jumbe, C. B., and Ricker-Gilbert, J. (2022). Making agricultural input subsidies more effective and profitable in africa: The role of complementary interventions. In *Research Anthology on Strategies for Achieving Agricultural Sustainability*, pages 896–908. IGI Global.

Karamba, R. W. and Winters, P. C. (2015). Gender and agricultural productivity: implications of the farm input subsidy program in malawi. *Agricultural Economics*, 46(3):357–374.

Kilic, T., Whitney, E., and Winters, P. (2015). Decentralised beneficiary targeting in large-scale development programmes: insights from the malawi farm input subsidy programme. *Journal of African Economies*, 24(1):26–56.

Lunduka, R., Ricker-Gilbert, J., and Fisher, M. (2013). What are the farm-level impacts of malawi's farm input subsidy program? a critical review. *Agricultural Economics*, 44(6):563–579.

Mason, N. M. and Ricker-Gilbert, J. (2013). Disrupting demand for commercial seed: Input subsidies in malawi and zambia. *World Development*, 45:75–91.

Messina, J. P., Peter, B. G., and Snapp, S. S. (2017). Re-evaluating the malawian farm input subsidy programme. *Nature plants*, 3(4):1–9.

Munthali, M. G., Davis, N., Adeola, A. M., Botai, J. O., Kamwi, J. M., Chisale, H. L., and Orimoogunje, O. O. (2019). Local perception of drivers of land-use and land-cover change dynamics across dedza district, central malawi region. *Sustainability*, 11(3):832.

Mwale, M., Von Fintel, D., Marchetta, F., Smith, A., and Kamninga, T. (2021a). The negative impact of farm input subsidies on women's agency in malawi's matrilocal settlements. *PEP Working Paper*.

Mwale, M. L., Kamninga, T. M., and Cassim, L. (2021b). The effects of the malawi farm input subsidy program on household per-capita consumption convergence. *Development in Practice*, pages 1–13.

Mwaniki, A. (2006). Achieving food security in africa: Challenges and issues. *UN Office of the Special Advisor on Africa (OSAA)*.

Ngcamu, B. S. and Chari, F. (2020). Drought influences on food insecurity in africa: A systematic literature review. *International Journal of Environmental Research and Public Health*, 17(16):5897.

Oreffice, S. (2007). Did the legalization of abortion increase women's household bargaining power? evidence from labor supply. *Review of Economics of the Household*, 5(2):181–207.

Peipert, J. F., Madden, T., Allsworth, J. E., and Secura, G. M. (2012). Preventing unintended pregnancies by providing no-cost contraception. *Obstetrics and gynecology*, 120(6):1291.

Pezzini, S. (2005). The effect of women's rights on women's welfare: Evidence from a natural experiment. *The Economic Journal*, 115(502):C208–C227.

Putnick, D. L. and Bornstein, M. H. (2016). Girls'and boys'labor and household chores in low-and middle-income countries. *Monographs of the Society for Research in Child Development*, 81(1):104.

Rakotoarisoa, M., Iafrate, M., and Paschali, M. (2011). *Why has Africa become a net food importer*. FAO Rome, Italy.

Ray, R. and Lancaster, G. J. (2003). *Does child labour affect school attendence and school performance?: Multi country evidence on SIMPOC data*. School of Economics, University of Tasmania Canberra.

Reich, J., Hein, S., Krivulskaya, S., Hart, L., Gumkowski, N., Grigorenko, E. L., Project, T. L. D., et al. (2013). Associations between household responsibilities and academic competencies in the context of education accessibility in zambia. *Learning and individual differences*, 27:250–257.

Ricker-Gilbert, J. (2014). Wage and employment effects of malawi's fertilizer subsidy program. *Agricultural Economics*, 45(3):337–353.

Riley, T., Sully, E., Ahmed, Z., and Biddlecom, A. (2020). Estimates of the potential impact of the covid-19 pandemic on sexual and reproductive health in low-and middle-income countries. *International perspectives on sexual and reproductive health*, 46:73–76.

Sánchez-Páez, D. A. and Ortega, J. A. (2018). Adolescent contraceptive use and its effects on fertility. *Demographic Research*, 38:1359–1388.

Sankhulani, L. (2007). Responding to the needs of the community: Examining the educational opportunities for girls in rural malawi. *International Education Journal*, 8(1):100–107.

Schultz, T. P. (1990). Women's changing participation in the labor force: a world perspective. *Economic Development and Cultural Change*, 38(3):457–488.

Shahidul, S. and Karim, A. (2015). Factors contributing to school dropout among the girls: A review of literature. *European Journal of research and reflection in educational sciences*, 3(2).

Sheahan, M. and Barrett, C. B. (2017). Ten striking facts about agricultural input use in sub-saharan africa. *Food Policy*, 67:12–25.

Shimamura, Y. and Lastarria-Cornhiel, S. (2010). Credit program participation and child schooling in rural malawi. *World Development*, 38(4):567–580.

Shively, G. E. and Ricker-Gilbert, J. (2013). Measuring the impacts of agricultural input subsidies in sub-saharan africa: Evidence from malawi's farm input subsidy program. *Purdue Policy Research Institute (PPRI) Policy Briefs*, 1(1):4.

Sibande, L., Bailey, A., and Davidova, S. (2017). The impact of farm input subsidies on maize marketing in malawi. *Food Policy*, 69:190–206.

Sikod, F. (2007). Gender division of labour and women's decision-making power in rural households in cameroon. *Africa Development*, 32(3).

Singh, S., Bankole, A., and Darroch, J. E. (2017). The impact of contraceptive use and abortion on fertility in sub-saharan africa: estimates for 2003–2014. *Population and development review*, 43(Suppl 1):141.

Susanli, Z. B., Inanc-Tuncer, O., and Kologlugil, S. (2016). Child domestic labour and mothers' employment in turkey. *Economic research-Ekonomska istraživanja*, 29(1):967–979.

Thornton, P., Saka, A., Singh, U., Kumwenda, J., Brink, J., and Dent, J. (1995). Application of a maize crop simulation model in the central region of malawi. *Experimental Agriculture*, 31(2):213–226.

Vlek, P. L., Le, Q. B., and Tamene, L. (2010). Assessment of land degradation, its possible causes and threat to food security in sub-saharan africa. *Food Security and Soil Quality. CRC Press, Boca Raton, Florida*, pages 57–86.

Walker, R. S. (1988). Women as food producers in developing countries: Impact on families. *Journal of Home Economics*, 80(2):24–29.

Wietzke, F.-B. (2020). Poverty, inequality, and fertility: the contribution of demographic change to global poverty reduction. *Population and Development Review*, 46(1):65–99.

Yaya, S., Uthman, O. A., Ekholuenetale, M., and Bishwajit, G. (2018). Women empowerment as an enabling factor of contraceptive use in sub-saharan africa: a multilevel analysis of cross-sectional surveys of 32 countries. *Reproductive health*, 15(1):1–12.

Appendices

A Summary statistics

Table A.1: Summary statistics for women's variables used in the study

N= 17978	(1) Mean	(2) SD	(3) Min	(4) Max
Contraceptive(Currently using a method to avoid pregnancy)	0.61	0.49	0.00	1.00
FISP (Living in a beneficiary household)	0.40	0.49	0.00	1.00
Proportion of ruling party votes in the district	0.41	0.28	0.04	0.91
Age	30.58	8.92	18.00	49.00
Uneducated	0.09	0.29	0.00	1.00
Primary education	0.62	0.49	0.00	1.00
Secondary education	0.26	0.44	0.00	1.00
Post secondary education	0.03	0.16	0.00	1.00
Married	0.68	0.46	0.00	1.00
Number of live children ever given birth to	2.82	2.05	0.00	12.00
Household landholding (hectares)	0.96	4.74	0.00	202.34
Male headed household	0.68	0.47	0.00	1.00
Age of the head	40.07	12.83	16.00	95.00
Northern region	0.23	0.42	0.00	1.00
Central region	0.33	0.47	0.00	1.00
South region	0.44	0.50	0.00	1.00

Table A.2: Summary statistics for children's variables used in the study

N= 15457	(1) Mean	(2) SD	(3) Min	(4) Max
Water (Fetched water in past week)	0.66	0.47	0.00	1.00
Firewood (Collected firewood in past week)	0.24	0.43	0.00	1.00
FISP (Living in a beneficiary household)	0.43	0.50	0.00	1.00
Proportion of ruling party votes in the district	0.42	0.28	0.04	0.91
Number of FISP beneficiaries in the district less one's own	329.75	132.09	16.00	534.00
Female	0.52	0.50	0.00	1.00
Age of child	10.29	3.74	5.00	17.00
Child is out of school	0.84	0.37	0.00	1.00
Primary education	0.04	0.19	0.00	1.00
Secondary education	0.01	0.12	0.00	1.00
Post secondary education	0.00	0.00	0.00	0.00
Household Land holding (hectares)	1.02	5.03	0.00	202.34
Male headed household	0.68	0.47	0.00	1.00
Age of the head	41.76	12.61	15.00	95.00
Northern region	0.21	0.41	0.00	1.00
Central region	0.33	0.47	0.00	1.00
Southern region	0.47	0.50	0.00	1.00

Table A.3: Differences in means by FISP and gender

	Female			Male		
	FISP	Non-FISP	t-test	FISP	Non-FISP	t-test
Water (Fetched water in past week)	0.842	0.752	0.090***	0.534	0.490	0.044***
Firewood (Collected firewood in past week)	0.368	0.265	0.118***	0.143	0.122	0.021*
Age of child	10.137	9.878	0.259**	10.276	10.093	0.183**
Child out of school	0.860	0.831	0.029***	0.849	0.835	0.014***
Primary education	0.034	0.034	0.000	0.024	0.032	-0.008
Secondary education	0.013	0.021	-0.008**	0.007	0.015	-0.008***
Household land holding	0.883	0.858	0.025	1.110	0.720	0.390***
Male headed household	0.680	0.657	0.023**	0.685	0.675	0.010
Age of the head	42.103	39.399	2.704***	41.984	39.799	2.185***
Northern region	0.116	0.103	0.013	0.133	0.096	0.037**
Central region	0.404	0.488	-0.084***	0.410	0.511	-0.101***
Southern region	0.480	0.409	0.071**	0.458	0.394	0.064*

B OLS results

Table B.4: Factors that affect women's contraceptive usage, and household child labour

	(1)	(2)	(3)	(4)	(5)	(6)
	Women		Boys		Girls	
	Contraceptive usage		Water	Firewood	Water	Firewood
FISP	0.031***	0.017*	0.038**	0.022*	0.081***	0.086***
	(0.009)	(0.010)	(0.017)	(0.012)	(0.012)	(0.015)
Age	-0.007***	-0.005***	0.032***	0.004***	0.038***	0.029***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Primary education	0.061***	0.051***	-0.139**	-0.041	-0.157***	-0.198***
	(0.017)	(0.018)	(0.057)	(0.046)	(0.028)	(0.044)
Secondary education	0.046**	0.020	-0.265***	-0.019	-0.397***	-0.391***
	(0.019)	(0.020)	(0.070)	(0.043)	(0.057)	(0.032)
Post secondary education	0.002	-0.030				
	(0.032)	(0.035)				
Married	0.257***	0.270***				
	(0.014)	(0.016)				
Number of living children given birth to	0.063***	0.052***				
	(0.004)	(0.004)				
Household landholding	-0.001	0.001	0.003**	0.002	0.002***	0.002*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Male headed household	0.081***	0.081***	-0.007	-0.048***	-0.037***	-0.037**
	(0.013)	(0.014)	(0.018)	(0.014)	(0.013)	(0.016)
Age of the head	-0.006***	-0.007***	-0.001	-0.001	-0.001***	-0.000
	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Central region	0.072***	0.081***	-0.005	-0.020	0.001	-0.143***
	(0.013)	(0.015)	(0.023)	(0.016)	(0.017)	(0.022)
Southern region	0.039***	0.046***	-0.020	-0.014	0.005	-0.122***
	(0.012)	(0.014)	(0.022)	(0.015)	(0.016)	(0.020)
Constant	0.526***	0.550***	0.214***	0.147***	0.470***	0.160***
	(0.033)	(0.037)	(0.041)	(0.032)	(0.029)	(0.036)
Observations	17978	14185	6764	6768	7391	7390

Standard errors in parentheses

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

C IV results

Table C.5: The effects of FISP on women's contraceptive usage, second round effects on child labour

	(1)	(2)	(3)	(4)	(5)	(6)
	Women		Boys		Girls	
	Contraceptive usage		Water	Firewood	Water	Firewood
FISP	0.548***	0.495**	0.700***	0.383***	0.433***	0.558***
	(0.200)	(0.222)	(0.208)	(0.136)	(0.051)	(0.044)
Age	-0.008***	-0.007***	0.030***	0.004*	0.037***	0.029***
	(0.001)	(0.001)	(0.003)	(0.002)	(0.002)	(0.002)
Primary education	0.014	0.004	-0.075	-0.006	-0.140***	-0.175***
	(0.026)	(0.030)	(0.072)	(0.052)	(0.031)	(0.042)
Secondary education	0.039*	0.013	-0.110	0.066	-0.359***	-0.339***
	(0.021)	(0.023)	(0.089)	(0.053)	(0.062)	(0.041)
Post-secondary education	0.121**	0.082				
	(0.058)	(0.065)				
Married	0.264***	0.281***				
	(0.016)	(0.018)				
Number of living children given birth to	0.058***	0.050***				
	(0.005)	(0.005)				
Household landholding	-0.002	-0.001	0.001	0.000	0.001	0.002*
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
Male headed household	0.075***	0.072***	-0.017	-0.053***	-0.040***	-0.041**
	(0.015)	(0.016)	(0.021)	(0.015)	(0.014)	(0.018)
Age of the household head	-0.008***	-0.008***	-0.003***	-0.002**	-0.003***	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Central region	0.111***	0.128***	0.074**	0.024	0.024	-0.113***
	(0.022)	(0.027)	(0.037)	(0.024)	(0.019)	(0.024)
Southern region	0.038***	0.050***	0.003	-0.001	-0.004	-0.133***
	(0.015)	(0.016)	(0.028)	(0.018)	(0.018)	(0.022)
Constant	0.492***	0.496***	0.033	0.047	0.409***	0.078*
	(0.040)	(0.050)	(0.076)	(0.052)	(0.034)	(0.041)
Observations	17978	14185	6764	6768	7391	7390
First-stage statistic	29.197	22.231	36.129	36.032	560.221	562.463

Standard errors in parentheses

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

D First stages

Table D.6: Factors that affect FISP participation

	(1) FISP	(2) FISP	(3) FISP
Proportion of ruling votes in 2019 elections for the district	0.216***	0.215***	
	(0.040)	(0.046)	
Number of FISP beneficiaries in the district less one's own			0.001***
			(0.000)
Age of the woman	0.002**	0.003***	0.004***
	(0.001)	(0.001)	(0.001)
Primary education	0.088***	0.097***	0.069***
	(0.017)	(0.018)	(0.017)
Secondary education	0.016	0.017	0.027
	(0.019)	(0.021)	(0.020)
Post secondary education	-0.222***	-0.226***	-0.123***
	(0.022)	(0.025)	(0.025)
Married	-0.012	-0.023	-0.014
	(0.014)	(0.016)	(0.015)
Number of living children given birth to	0.010***	0.005	-0.004
	(0.004)	(0.004)	(0.004)
Household landholding	0.002**	0.003*	0.002*
	(0.001)	(0.001)	(0.001)
Male headed household	0.011	0.019	0.019
	(0.013)	(0.015)	(0.014)
Age of the head	0.005***	0.004***	0.004***
	(0.000)	(0.001)	(0.001)
Central region	-0.063***	-0.084***	-0.003
	(0.014)	(0.016)	(0.015)
Southern region	-0.104***	-0.114***	0.037**
	(0.023)	(0.027)	(0.014)
Constant	0.027	0.073*	-0.261***
	(0.033)	(0.039)	(0.038)
Observations	17985	14190	14190

Standard errors in parentheses

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