



Contents lists available at ScienceDirect

World Development

journal homepage: www.elsevier.com/locate/worlddev

Unraveling the effect of targeted input subsidies on dietary diversity in household consumption and child nutrition: The case of Malawi

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ARTICLE INFO

Article history:

Accepted 19 January 2018

Keywords:

Child nutrition
Dietary diversity in household consumption
Fertilizer
Subsidy
Two stage least squares

ABSTRACT

Malawi's Farm Input Subsidy Program (FISP) has generated significant attention, with several studies showing an increase in maize production since the inception of the program in 2005, but stagnating poverty levels. In this study, I examine whether and how FISP has affected dietary diversity in household food consumption and child nutrition. I find that children under the age of five living in households that received a voucher between 2008 and 2013 for the purchase of fertilizer have a statistically significantly higher (at the 1% level) weight-for-age, weight-for-length/height and body mass index than children living in non-recipient households. I also find that households having received a voucher consume cereals, nuts, vegetables, meats and fruits more frequently than non-recipient households. The analysis uses two stage least squares to account for the endogeneity of selection into the fertilizer subsidy program. I test the robustness of these results using child fixed effects. The results indicate that past studies evaluating FISP failing to account for the positive gains in child nutrition and household food consumption diversity may be underestimating its benefits.

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1. Introduction

Africa's agricultural productivity continues to lag behind the rest of the world. Despite high expected payoffs to organic and inorganic fertilizer, farmers in Africa report little use, especially compared to farmers in Asia, Latin America, North America and Europe. Several studies offer various explanations for low observed fertilizer use, including the variability of fertilizer returns over seasons, heterogeneous response to fertilizer conditional on soil characteristics, difficulty in accessing inputs, synergistic relationships between fertilizer and other inputs (like irrigation and/or improved seeds), etc. (Duflo, Kremer, & Robinson, 2008, 2011; Jayne & Rashid, 2013; Marenya & Barrett, 2009a, 2009b; Sheahan, Black, & Jayne, 2013). One way in which policy makers have responded to some of these constraints is by subsidizing farmers' fertilizer purchases. The resurgence of subsidies to encourage the use of agricultural inputs over the last decade has generated significant attention often claiming to achieve the dual objective of both increasing food security and decreasing poverty (Jayne et al., 2011; Kelly, Crawford, & Ricker-Gilbert, 2011).

Quantifying the gains to dietary diversity in household consumption and child nutrition from input subsidy programs is important yet to date over-looked. In Malawi, despite higher yields

attributed to its inputs subsidy program, some have criticized its high cost, starting in 2005–2006 at US \$50 million, and growing to US \$265 million during the 2008–2009 growing season (Chibwana, Fisher, & Shively, 2012; Dorward & Chirwa, 2011). The program accounted for 5.6% of the national budget in 2005–2006 increasing to 16.2% in 2008–2009 and decreasing to 6.5% in 2010–2011 (Dorward & Chirwa, 2011).¹ Given that poor nutrition early in childhood has been shown to be associated with poor cognitive performance and lower hourly wages in adulthood (Hoddinott, Maluccio, Behrman, Flores, & Martorell, 2008), studies examining the benefit cost ratios of input subsidy programs that do not account for increased dietary diversity in household consumption and child nutrition could be under-reporting its gains.

In this paper, I test whether the subsidy program in Malawi affects dietary diversity in household food consumption and child nutrition. I find that children under the age of five living in households that received a voucher for the purchase of fertilizer have a statistically significantly higher (at the 1% level) weight-for-age, weight-for-length/height and body mass index than children living in non-recipient households. I also find that households having received a fertilizer voucher consume cereals, nuts, vegetables, meats and fruits more frequently than non recipient households.

¹ The large increase in cost in 2008–2009 is largely attributed to soaring global fertilizer prices at the time (Dorward & Chirwa, 2011).

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The analysis uses two stage least squares to account for the endogeneity of selection into the fertilizer subsidy program.

2. Background

In an effort to increase agricultural production, fertilizer use in Africa during the 1960s and 1970s was promoted and encouraged through universal subsidies, input credit programs, commodity marketing parastatals and centralized fertilizer procurement and distribution sites, with various degrees of success (Crawford, Kelly, Jayne, & Howard, 2003; Denning et al., 2009). During the 1980s, however, it became apparent that such programs were financially unsustainable, difficult to implement and inefficient. Under the structural adjustment programs of the 1980s and 1990s, parastatals and input subsidies were dismantled leading to a decrease in agricultural productivity and decline in Africa's soil health (Druilhe & Barreiro, 2012).

Several African countries began to reintroduce subsidy programs in the 2000s in an effort to promote and enhance food security (Jayne & Rashid, 2013; Kelly et al., 2011). The new subsidy programs of the 2000s, known as 'smart subsidies' or 'targeted subsidies', were designed to target poorer smallholder farmers who were not using fertilizer but for whom it would be profitable to do so. Furthermore, targeted subsidies often included complementary inputs, and promoted competition and the development of the private sector (Morris, Kelly, Kopicki, & Byerlee, 2007). Targeted farmers received vouchers they could redeem at participating agro dealer shops, thereby promoting private sector participation. Suppliers took the voucher to a designated agency which reimbursed them for the value. Targeted subsidies programs began in Malawi and were followed by similar programs in Nigeria, Zambia, Tanzania, Kenya and Ghana (Druilhe & Barreiro, 2012).

In Malawi, a small-scale targeted input subsidy program called the Starter Pack Scheme was introduced in 1998 distributing 15 kg of fertilizer, 2 kg hybrid maize seed and 1 kg legume seed – enough to cultivate 0.1 ha of land at no cost to the recipient (Holden & Lunduka, 2012). The program, first known as the Agricultural Input Subsidy Program and later renamed Malawi's Farm Input Subsidy Program (FISP), was scaled up in 2005 to include approximately 50% of farmers in the country after a severe drought resulted in 4.2 million people, or 38% of its population, to require food aid (Denning et al., 2009; Holden & Lunduka, 2012). In later years, up to 50–70% of households acquired FISP coupons in any given year (Lunduka, Ricker-Gilbert, & Fisher, 2013). The program, still ongoing today, distributes vouchers for fertilizer, hybrid or OPV seeds and/or pesticides at reduced prices. Recipients receive vouchers for one 50 kg bag of basal fertilizer and one 50 kg bag of urea.² The subsidy covered 64–91% of the cost of fertilizer between 2005 and 2010. Initially, open pollinated variety (OPV) maize seeds were distributed but were subsequently replaced predominantly by hybrid maize varieties. In 2007–2008, FISP also distributed cotton and legume seeds, and in 2008–2009 it also distributed fertilizers for cash crops including tea, coffee and tobacco (Lunduka et al., 2013). In 2009–2010 the FISP bundle supported maize fertilizers, maize seed, legume seed and storage pesticides.

Government statistics revealed record maize production levels following FISP, with maize production doubling in 2006, then tripling in 2007, going from a 43% national deficit in 2005 to a 53% surplus in 2007 (Denning et al., 2009; Lunduka et al., 2013). The accuracy of these dramatic high production levels has been questioned, however, especially when compared to household-level

studies, which find statistically significant production gains attributable to FISP, but at smaller rates. Ricker-Gilbert and Jayne (2011) find that on average, one additional kilogram of fertilizer increased maize production by 1.82 kg. Given the high cost of fertilizer relative to maize, such returns are not profitable for farmers. One additional kilogram of fertilizer acquired by households in each of the three previous years was found to boost maize production by 3.16 kg on average, which the authors attribute to either nutrient build up or learning effects.

Despite greater fertilizer use and yields, a study completed by the Malawi National Statistical Office and the World Bank found little change in poverty rates between 2003/2004 and 2009/2010, decreasing only from 52.4% to 50.7%, despite an increase in GDP in that time frame. However, the study finds that rural poverty during this time period rose (Jayne & Rashid, 2013; Lunduka et al., 2013). Pauw, Beck, and Mussa, (2016) find a larger drop in poverty between 2004/2005 and 2010/2011, of –8.2 percentage points. However, they find that poverty rates decreased less for the poorest of the poor. They also find that farmers spent a greater portion of their incomes on food in 2011 than in 2004, which they explain in part by a higher inflation for food than non-food items. Neither of these studies, however, are causally linked to FISP. Household-level studies on poverty find that 1 kg of subsidized fertilizer boosted net crop income by \$1.15 compared to \$0.55–0.90 per kg for full retail price of fertilizer (Ricker-Gilbert & Jayne, 2011), but ultimately finding that FISP made no significant contribution to average household asset wealth over time. Arndt, Pauw, and Thurlow (2016), on the other hand, use a general equilibrium model and find that FISP alone could have accounted for a 1.7–2.8 percentage point reduction in national poverty.

Many studies have been conducted on Malawi's input subsidy program, focusing on different aspects of its implementation and its effects, e.g., the effect of the program on maize yields, farmer crop allocation, household expenditure, assets, income, poverty, food security, use of organic inputs, demand for commercial fertilizer, etc. (Lunduka et al., 2013). In terms of the nutrition effects of FISP, I am only aware of one study which examines the causal relationship between FISP and nutrition outcomes. Karamba (2013) studies the effect of input subsidies on child nutrition. Consistent with the findings from this study, she finds that FISP has a positive effect on nutritional status, but she finds that these gains are associated with greater non-food consumption. Her research focuses on the year 2010 and thus she examines the effect of receiving a voucher on child nutrition within a year. In this study I look at both the cumulative effect of FISP vouchers received between 2008 and 2013 on nutrition outcomes in 2013 and its effect on the change in nutrition between 2010 and 2013, as discussed further below.

3. Data

To study the effect of Malawi's FISP on dietary diversity in household consumption and child nutrition, I use panel data collected from the Third Integrated Household Survey (IHS3) from 2010 to 2011 and Malawi's Integrated Household Panel Survey (IHPS) from 2013. The surveys were collected by the Malawi National Statistical Office in collaboration with the World Bank to monitor and evaluate the poverty, vulnerability and changing conditions of Malawian households. A subsample of the IHS3 data, 3246 households in 32 districts and 204 enumeration areas, were randomly selected to be part of the panel subcomponent, surveyed again in 2013 as part of the Integrated Survey on Agriculture initiative (ISA). The 2013 survey attempted to revisit all 3246 original households and also tracked individuals that moved away or split from their baseline dwellings. Because of the added newly created households, the IHPS sample size increased to include 4000

² The program was designed to distribute one bag of basal fertilizer and one bag of urea per household, though some households received more than one voucher. Most respondents report receiving an average of 1.5 coupons, i.e., they received either one or two coupons (Chirwa & Doward, 2013).

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