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**Macro evaluation of program impacts and risks: The case of
Malawi's Farm Input Subsidy Program (FISP)**

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ABSTRACT

While the Government of Malawi prepares to implement the ninth consecutive Farm Input Subsidy Program (FISP), this paper takes stock of the literature and complements past evaluations by estimating the general equilibrium effects of the program. The objective is to better understand the various positive and negative spillover effects of the program, including direct and indirect production or income effects in the agricultural sector and beyond, government financing implications, and the impacts on Malawi's foreign exchange position. We calibrate a computable general equilibrium (CGE) model with a recently developed but backdated 2003/04 social accounting matrix (SAM) for Malawi—to evaluate the program impacts, using the broad design elements of the 2006/07 program as basis for the policy shock. Focusing on the maize component of FISP, this entails providing around 150,000 metric tons (mt) of fertilizer at a heavily subsidized rate (about 72 percent of the cost is subsidized) as well as modern maize seed varieties to just over half of Malawian smallholders. The resulting intensification of the maize production system raises maize production in our model by 14 percent and maize yields by more than 30 percent. We also find crop diversification increases as some land formerly under maize cultivation is reallocated to other crops following the increased production of maize. While returns to factor of production rise rapidly, the program contributes little to growth and national poverty declines marginally (i.e., by less than three percentage points) when overall program effects (including price and financing implications) are taken into account.

While many analysts have remained positive about FISP despite its cost, the Malawian government has in recent years faced a particular challenge of maintaining the program during what has proven to be one of the most challenging economic periods in the past two decades. Shortly after the fertilizer price shock in 2008/09, which caused program costs to skyrocket, a series of external shocks—most notably a sharp decline in tobacco prices—placed tremendous pressure on the country's balance of payments position. Government was able to contain program costs by maintaining a fixed exchange rate, but the dwindling foreign exchange reserves eventually meant that policy position became untenable by early 2012. The sharp devaluation that followed will have a dramatic effect on program costs in the 2012/13 implementation period. Our analysis therefore also considers implications of external shocks (fuel, fertilizer, and tobacco prices) and the exchange rate regime on FISP costs and effectiveness. The substantial cost of the program has always meant the benefits of the program have been closely monitored. Other socio-economic policies with similar objectives are also frequently offered as alternatives; hence, a final contribution of the paper is to consider the effects of targeted and universal social cash transfer programs. We find that while a cash transfer with a similar budget may be more effective at reducing poverty, it does not promote value addition and food production in the way that FISP does. Ideally, therefore, FISP and cash transfers should be seen as complementary rather than competing, with the former targeting cash-constrained poor farmers with the potential to significantly increase staple food production and the latter to the poorest labour constrained households with little or no land.

Keywords: Agricultural input subsidies; general equilibrium models; Malawi; social cash transfers

1. INTRODUCTION

The Malawian agricultural sector contributes more than one-third to gross domestic production (GDP) and accounts for 80 percent of employment in the country. The dominant agricultural activity is rainfed cultivation of the staple crop maize, which accounts for roughly one-quarter of agricultural GDP and about one-tenth of national GDP (Benin et al 2008). Malawi's erratic GDP growth path and slow progress in poverty reduction is often blamed on the overreliance on a maize sector that is particularly vulnerable to frequent droughts and floods (see Pauw et al. 2011; Devereux 2006). The uncertain agricultural policy milieu—including the bizarre “start-stop” nature of fertilizer subsidy policies over a two-decade period since the 1990s (Buffie and Atolia 2009; Harrigan 2008) and erratic government interventions in the maize market (Minot 2010)—has further contributed to instability in the agricultural sector and has ultimately had a detrimental effect on farmers' expectations, food production levels, and price volatility.

Since 2005/06 there has been a semblance of stability in agricultural policy direction and the agricultural growth trajectory when, in response to the food supply problems experienced during the 2004/05 season, the government introduced the Farm Input Subsidy Program (FISP). The program has since been lauded particularly for its success in raising maize yields and bringing about food security in Malawi, with official crop statistics claiming a three-fold increase in maize production within the first two years of inception (MoAFS 2010). The impact was much improved economic growth, with agricultural and national GDP purportedly expanding by more than seven percent per annum in real terms during 2004–2010 (NSO 2011). The program is currently in its ninth year of implementation and continues to receive full support from the government despite a recent regime change.

More recently, however, the enthusiasm about FISP has been dwindling. During most of the implementation years thus far the country has received sufficient rainfall, thus making it hard to estimate the extent to which production gains can actually be attributed to the subsidy itself (Dorward and Chirwa 2011a; Holden and Lunduka 2010). Maize price behavior during 2007–2009 further casts doubt on the reliability of official crop production estimates (Jayne and Tschirley 2009; Dorward et al. 2011). Implementation efficacy is marred by frequent reports of corruption and tender irregularities. The program has also been criticized for its weak poverty-reducing effects. Recently released poverty statistics suggest only a marginal decline in national poverty from 52.4 in 2004/05 to 50.7 percent in 2010/11 while rural poverty increased marginally (NSO 2012). This brings into question the reliability of official GDP growth estimates and the effectiveness with which FISP targets the most vulnerable in society.

The financial sustainability of the program has also been brought into question, especially in recent years when economy slumped into recession and a severe foreign exchange crisis ensued. The latter was brought on by several factors, including steadily declining tobacco prices during 2010–2012, the suspension of foreign aid under the Common Approach to Budgetary Support (CABS) in 2011, and an all-time low in international investor confidence leading to a decline in foreign direct investment (Pauw et al. 2012). Foreign exchange problems were further compounded by the country's weak export performance over the past decade (MoIT 2012). The foreign exchange shortage has meant that imports and capital expenditure have had to be constrained in past 2–3 years, while policy programs such as FISP that rely heavily on imports have become increasingly difficult to implement.

During much of the implementation period the FISP budget itself was contained by maintaining a fixed exchange rate. However, this did not shield the program budget from a dramatic 140 percent increase in world fertilizer prices between 2007/08 and 2008/09 (Heady and Fan 2010). The move to a flexible exchange rate regime in April 2012 caused the exchange to depreciate by more than 100 percent in the space of eight months. With about 85–90 percent of the program cost made up of imported fertilizer, program costs for the current implementation year will once again be considerably higher. FISP currently consumes 70 percent of the agricultural budget, which leaves very little room for spending on other important areas of agricultural spending such as extension services and rural infrastructure.

Although Malawi's fertilizer subsidy program has been evaluated extensively, some information gaps still exist. This study contributes to the literature in three ways. First, we consider costs and benefits

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within a general equilibrium context. Most program evaluations have made use of partial equilibrium-type models that measure or observe the direct effects of FISP but do not adequately capture all the indirect or “spillover” effects. A general equilibrium approach allows us to assess both the direct and indirect effects of the policy. The latter include, among other things, impacts on factor markets and prices across a broad spectrum of commodities. This is important in the context of FISP, partly given the size of the program, but also because “the ability of fertilizer subsidy programs to lower maize prices and increase agricultural wage rates could have a more pronounced effect on the welfare of the poor than does receiving the subsidy directly” (Dorward et al. 2008).

Secondly, we consider risk factors and their implications for costs and financing of the program. As far as the latter is concerned, we evaluate outcomes under various funding models, including a purely donor-funded program, a purely government-funded program, and a jointly funded program styled on the actual program where about one-quarter of the program cost is borne by donors. Fertilizer costs make up the bulk of the program cost; hence, two major risk factors are fertilizer prices and the exchange rate, which can either be fixed or free-floating (flexible) depending on the exchange rate regime adopted. Given the importance of tobacco in the Malawian economy, tobacco price movements may also have a significant impact on the exchange rate. We therefore also model the effect of the recent decline in tobacco prices on the program effectiveness and costs under alternative exchange rate regimes.

Thirdly, in acknowledgement of the fact that benefit-cost ratios are only truly useful when compared to alternative policies, we compare the fertilizer subsidy program of Malawi against a hypothetical cash transfer program with similar budget. Both universal and targeted (means-tested) programs are evaluated. While this is neither an exhaustive analysis of cash transfers, nor a detailed assessment of cost-benefit ratios of either program, the cash transfer scenarios provide an interesting benchmark against which FISP benefits can be evaluated, both in terms of pure economic effects (e.g., production and GDP growth) and welfare effects (e.g., household incomes and poverty).

The remainder of the paper is organized as follows. Section 2 provides an overview of the design and implementation of FISP, drawing on the extensive literature and official program reports and evaluations. Section 3 introduces the computable general equilibrium (CGE) model and data used and provides details about the simulations. Section 4 presents the model results, while section 5 draws general policy conclusions.

2. FERTILIZER SUBSIDY PROGRAM OVERVIEW

A history of input subsidization

Malawi has a long tradition of subsidizing agricultural inputs. The most comprehensive subsidy program since the Drought Recovery Inputs Project in 1992/93 was the Starter Pack (SP), introduced in the 1998/99 and 1999/2000 cropping seasons. SP distributed two kilogram (kg) hybrid maize seed, 1kg legume seed, and 15kg fertilizer to all Malawian smallholders, which at the time numbered approximately 2.8 million. The free inputs were sufficient to cultivate about 0.1 hectares (ha) of land (Harrigan 2008). Due to donor pressure and the widely held belief that SP was undermining the development of private sector input delivery, that it created maize dependency, and that it was too costly to government, a scaled-down Targeted Input Program (TIP) was introduced in 2000/01 and 2001/02. This program had between one and 1.5 million beneficiaries. When the country was rocked by a food crisis in 2001/02 many believed this a result of the scaling down of SP; hence, an “extended” TIP was implemented again in 2002/03, which once again reached 2.8 million beneficiaries. Looking back, it is interesting to note that only in 1998/99, 1999/2000, and 2002/03 when SP or TIP were universally targeted did Malawi produce a surplus of maize (Harrigan 2008). Although these were also good rainfall years, which meant that not all the production gains could be attributed to the subsidy programs, it is clear to see why Malawian policymakers have always held agricultural subsidies in such high regard. By 2003/04 TIP was once again scaled back to 1.7 beneficiaries, while a near-universal TIP was implemented last-minute in 2004/05 during the 2004 election campaign (Harrigan 2008). In the following year the newly elected President Bingu wa Mutharika cemented his popularity by launching the FISP in 2005/06.¹

Objectives and basic program design

The principle objective of FISP is to ensure food security in Malawi by raising agricultural production and yields. The program’s focus has primarily been on the provision of fertilizer and higher-yielding modern maize seed varieties, which are often prohibitively expensive to smallholders. Other program components have included the provision or subsidization of “tobacco” fertilizer, legume seed, and other chemicals. The analysis in this study focuses largely on the “maize” component of the program. In terms of this component of FISP, each beneficiary, by design, receives two coupons for maize fertilizer, which are redeemable for one 50kg bag of basal fertilizer and one 50kg bag of top-dressing. Since the 2006/07 implementation season “planned” fertilizer distribution ranged from 150,000–170,000 metric tons (mt). Actual fertilizer distribution peaked at 216,000mt in 2007/08. A redemption price of MK950 was set for each bag of fertilizer in 2005/06 (approximately USD6.80 at the time), but this fee was systematically lowered over time, reaching MK500 by 2009/10, which in real terms is about half the original redemption fee (i.e., USD3.40). While the redemption fee has declined, dollar-denominated fertilizer prices escalated sharply since the program’s inception. The fertilizer subsidy rate has therefore varied from as little as 64 percent in 2005/06 to a high of 91 percent in 2008/09 when fertilizer prices peaked.

In addition to fertilizer, beneficiary households also receive a maize seed coupon which, in theory, provides a choice between packets of hybrid or composite maize seeds.² In 2005/06 hybrid seeds were packaged in 2kg bags while lower-yielding composite seeds were available in 3–4kg bags. Maize seed distribution was expanded over time so that by 2009/10 the choice was between 5kg hybrid seeds or 7.5–10kg composites. Both the expansion of seed distribution and an increased emphasis on hybrid over composite seeds are prominent features of the program. For example, in 2006/07 around 4,500mt maize

¹ The policy was initially known as the Agricultural Input Subsidy Program (AISP).

² Hybrids are cross-bred varieties that cannot be recycled, but display significant yield gains over local and composite varieties. Composites are improved open-pollinated varieties (OPVs), which are recyclable for 3–5 years and are bred scientifically to enhance suitability to local environments (e.g., various drought-resistant varieties in Malawi are categorized as composites). Local varieties are traditionally-grown, open-pollinated seeds often recycled for generations (Smale et al. 1995; Denning et al. 2009).

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seed was distributed, of which 61 percent was hybrids. By 2009/10 maize seed distribution reached 8,500mt, of which 88 percent was hybrid seed. Seed coupons were initially redeemable free of charge at private seed distributors, but in later years a discretionary “cash top-up” not exceeding MK100 could be set. Despite rapid expansion of seed provision the seed cost is still small relative to the cost of fertilizer provision; for example, maize seeds accounted for around one-fifth of the program cost in the most recent implementation years, compared to less than eight percent in 2006/07.

During the first few years FISP also included a “tobacco” fertilizer component. This component of the program was always small—tobacco fertilizer accounted for about 12 percent of subsidized fertilizer in 2006/07—and was phased out completely by 2008/09, presumably as a result of the overproduction of burley tobacco in Malawi. Other inputs distributed under the auspices of FISP include maize storage chemicals (since 2008/09), as well as a variety of legume seeds which first became available in 2007/08. This component of the program has been particularly favored by development partners who have always remained cautious about contributing financially to the fertilizer component of the program. The popularity of the legume seed component stems from the fact that it increases the income earning opportunities for smallholders, raises dietary diversity in the household, and raises long term soil fertility due to the nitrogen-fixing characteristics (GoM 2011).

The targeting criteria of FISP have been a source of contention and even confusion. Most experts consider that the intended beneficiaries are smallholder farmers who cannot afford to purchase fertilizer inputs at commercial prices but have sufficient land and human resources to make effective use of subsidized inputs; in short, the “productive poor” (Dorward et al. 2008; Lunduka et al. 2012; Chibwana et al. 2010a). Perhaps the most problematic aspect of the targeting criteria is that most smallholders in Malawi are poor maize producers and could theoretically lay claim to the subsidy (Chinsinga 2012). Only large-scale commercial farmers have been explicitly excluded from the start.³ It is ultimately up to local leaders to identify who among eligible households are most deserving of the subsidy. Inconsistencies in targeting and implementation of the policy across regions and over time have therefore been commonplace.

Several program evaluations show that households with relatively more land and other assets have had a better chance of accessing the subsidy relative to vulnerable and resource-poor households (see Chibwana et al. 2010a; Dorward et al. 2008; Ricker-Gilbert et al. 2011; Holden and Lunduka 2010, FUM 2011, Dorward and Chirwa 2011b). The coupon allocation system is, however, gradually being reformed. For example, coupons are allocated to districts according to the number of households rather than land cultivated with maize; public village meetings are held to ensure greater transparency in the coupon allocation process; farm household registers are being maintained to prevent “outsiders” from becoming beneficiaries; and targeting criteria are being communicated annually through an implementation guideline. According to those guidelines, preferential access should be given to guardians looking after physically challenged persons, child- or female-headed households, and those households affected by HIV/AIDS (GoM 2011).

Measuring program impacts

Evaluations of FISP impacts are marred by unreliable estimates of crop production and areas of land cultivated, as well as difficulties in identifying coupon recipients (see Dorward and Chirwa 2010). Even ex ante estimations of yield or production effects of input subsidies are prone to large variations depending on assumptions made. In general, soil conditions, weather patterns, and farming practices will affect average yields and yield responses to changes in input types and input use intensities. With respect to FISP in particular, variations in the make-up of the “benefits package”, complementary input use by beneficiaries, and input displacement or land allocation effects lead to differential impacts of the program across different recipients. We briefly discuss some of these issues below.

³ See the 2006/2007 Budget statement delivered in the national Assembly of Malawi by Honorable, MP Minister of Finance at the New State House, Lilongwe on Friday 16th June 2006.

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The FISP benefits package, coupon distribution, and input application rates

A standout feature of FISP is that not all beneficiaries receive the standard package of two bags of fertilizer and a packet of seed. A 2008 survey of 380 households in Malawi's southern and central regions showed that only 42.2 percent of beneficiary households received the full package, while a further 18.8 percent received one fertilizer coupon and seed. The remaining beneficiaries were split into roughly equal-sized groups receiving seed only, one bag of fertilizer only, two bags of fertilizer only, or more than two bags of fertilizer and seed (Chibwana et al. 2010a). Another study found that the "average" beneficiary household received 87kg subsidized fertilizer in 2006/07, which is equivalent to 1.7 coupons (Dorward et al. 2008). This is partly due to program design (i.e., the imbalance between the number of fertilizer and seed coupons means not everyone can receive the full package) and partly due to the flexible targeting mechanism (e.g., village leaders may try to reach more of their constituents by distributing coupons more widely). Sharing or trading of coupons and beneficiary rotation over time further contributes to benefits packages being nonstandard (see Holden and Lunduka 2010; Ricker-Gilbert and Jayne 2011).

Although per capita fertilizer distribution under FISP far exceeds that of earlier subsidy programs, it still only covers a fraction of the average beneficiary smallholder's maize land. The same is true for subsidized seed. Variations in land holdings and benefits packages make it difficult to estimate the exact "coverage" of the subsidized inputs; hence we can only talk about ranges and averages. Estimates of land holdings of FISP beneficiary households range from 0.90ha (Filipski and Taylor 2011) to 1.41ha (Dorward et al. 2008), with about half of that land (0.5–0.6ha) allocated to maize (Benin et al. 2008). The full fertilizer complement under FISP includes 50kg basal NPK (23 percent nitrogen) and 50kg urea as top-dressing (43 percent nitrogen), which at recommended fertilization rates of around 100kg nitrogen per hectare for hybrid maize (MPTF 1999) is sufficient for 0.33ha or 45–60 percent of the average farmer's maize land. For those growing local maize the full fertilizer package will cover about 0.46ha of land given a lower recommended fertilization rate of around 72kg nitrogen/hectare (Holden and Lunduka 2010).

Recommended seed planting rates vary by seed type and planting method (e.g., spacing between plants and number of kernels per planting hole). Survey data suggests that Malawian farmers use about 12–13kg modern seed varieties per hectare (Dorward et al. 2008), although recommended rates are sometimes double that.⁴ Simtowe et al. (2010) estimate seed planting rates in excess of 25kg/ha in some districts in Malawi, which presumably includes both local and modern maize seed varieties. Local maize seed rates are higher given their lower viability. If, for argument sake, we assume seed planting rates of 15, 20, and 25kg/ha for hybrid, composite, and local seeds respectively, the distributed hybrid and composite seed packages were sufficient for about 0.15ha in 2006/07 and 0.35ha by 2009/10. The more recent programs have therefore been more "balanced" in terms of the coverage of the seed and fertilizer packages, with both covering roughly one-third of a hectare per farmer.

By design, therefore, FISP translates to around 1.5 million beneficiaries receiving inputs sufficient for approximately 0.33ha of land each at recommended or optimal input application rates. At the country-level this translates to around 500,000ha of land under subsidized cultivation of maize. In reality, however, beneficiary farmers are more likely to apply inputs at less than the recommended rate, partly because the average farmer does not receive the full benefits package, and partly because they traditionally cultivate more than 0.33ha maize. For example, in 2006/07 there were around 1.72 million beneficiaries, each receiving 87kg of subsidized inputs. At an assumed fertilization rate of 66kg nitrogen/hectare (or two bags per 0.5ha maize), the subsidy program would cover about 750,000ha land. Theoretically, these two "models" of farmer behavior could have very similar direct production effects, especially when the higher yield obtained under optimal input use offsets the fact that less land is cultivated. However, an important factor to consider is the indirect effect associated with demand for

⁴ Personal communication, Mr. Nic Bennet, Pannar Seeds, Lilongwe Malawi.

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land: a more extensive farming model potentially implies that less agricultural land is available for other uses. We consider input displacement effects in further detail below.

Input displacement, land allocation effects, and labor market impacts

FISP intends to target those who cannot afford to purchase fertilizer at commercial rates. A poorly targeted program may displace commercial fertilizer that would have been purchased in the absence of the subsidy. The extent of fertilizer displacement will determine the net increase in fertilizer use, which in turn determines the overall production gain associated with the subsidy program. Ricker-Gilbert et al. (2011) estimate an average displacement rate of 22 percent, which is comparable with the estimate by Dorward et al. (2008) for maize fertilizer. This means that every 1kg subsidized fertilizer crowds out 0.22kg commercial fertilizer (put differently, each additional 1kg subsidized fertilizer increases total fertilizer use by 0.78kg). Displacement rates are lower for poor households (0.18kg) than for non-poor households (0.30kg) given lower initial fertilizer purchases by the poor, which implies targeting poorer households maximizes the contribution of the program to total fertilizer use (Ricker-Gilbert et al. 2011).

Whether or not FISP “crowds in” or “crowds out” maize land also has implications for the program’s overall production effects. One theory is that provision of free inputs may act as an incentive to farmers to increase land allocation to subsidized maize. Earlier maize subsidy programs in Malawi have been criticized for creating a maize dependency and lowering crop diversification (see Harrigan 2008). The subsidy program may even act as an incentive to non-maize farmers to switch to maize in order to become eligible for the subsidy (see Kankwamba et al. 2012). A counter-argument is that input subsidies promote intensification of staple crop production and therefore free up agriculture land for cultivation of other crops. Diversification may be further promoted when the profit margins of subsidized crop cultivation decline as a result of increased supply and declining prices.

Evaluations of land allocation and crop diversification effects of FISP have produced mixed results. Chibwana et al. (2010a) compare land allocation patterns among beneficiaries and non-beneficiaries and find, after controlling for selection into either of these groups, that beneficiaries allocated 16 and 46 percent more land to maize and tobacco respectively and 21 percent less land to other crops. It should be noted that their analysis is based on one-period cross section data, while their selection equation does not control for whether someone is primarily a maize (or tobacco) farmer, an obvious requirement for selection. Holden and Lunduka (2010), on the other hand, use panel data and find that the average maize area share had declined among beneficiaries during 2006–2009, both as a result of intensification of maize production and an increase in areas under other crops. Kankwamba et al. (2012) concur and find that beneficiary households have a higher crop diversification index. However, they also find that overall crop diversification has declined in Malawi since the introduction of FISP, which lends credence to the theory that non-maize farmers have resorted to switching to maize in order to become eligible for the subsidy.

Input subsidies may have implications for the labor market through its impact on demand for or supply of agricultural labor. Ricker-Gilbert (2012) estimates two equations to determine, firstly, how acquisition of subsidized fertilizer affects Malawian households’ decision to participate in the labor market, and secondly, how average community wages for hired farm laborers (called *ganyu*) is affected by the supply of subsidized fertilizer in a community. Acquiring subsidized fertilizer does not have a significant effect on a household’s decision to participate in the *ganyu* labor market, but for those households that have supplied *ganyu* labor before, every 100kg subsidized fertilizer reduces the probability that a household will supply *ganyu* labor by 3 percentage points. The study further finds that a 10kg increase in the amount of subsidized fertilizer per household in a community raises the median agricultural wage by 1.5 percent.

Inherent yield benefits associated with modern seeds and fertilizer application use

A key determinant of the impact of FISP is the maize yield response to modern seed variety adoption and/or increased use of fertilizer. Yield responses to seed varieties can be expressed as the additional yield (in mt/ha) obtained when switching from local to other varieties. Several studies surveyed by Dorward et al. (2008) suggest a yield response to hybrid seed adoption in the range 0.19–0.25mt/ha.

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Chibwana et al. (2010b) report a very similar range, while Holden and Lunduka's (2010) estimate is slightly higher at 0.32mt/ha using panel data spanning a longer period of time. To our knowledge no analysis had been done on the yield response to composite seed adoption. In various FISP evaluations Andrew Dorward assumes a yield gain of 0.10mt/ha for composites and 0.20mt/ha for hybrids.⁵

The yield response to fertilizer use is expressed as the additional kg grain per additional kg of nitrogen (N). Based on a survey of several such studies relevant to the Malawi case, Dorward et al. (2008) conclude that nitrogen response rates of 10–12kg/kg N for local varieties, 15kg/kg N for composites, and 18–20kg/kg N for hybrids are reasonable. In the case of FISP, however, there is no evidence about how subsidized fertilizer was applied across different seed types; hence in Dorward et al.'s (2008) own ex ante benefit-cost analysis an average, non-variety specific response rate of 15kg/kg N is assumed, with 12 and 18kg/kg N as lower- and upper-level bounds.

A number of studies evaluate actual yield responses to subsidized fertilizer use under FISP. To facilitate comparability we translate these findings to a nitrogen response rate. Chibwana et al. (2010b) estimate a nitrogen response rate of 12kg/kg N for local seeds, but (surprisingly) their response rate for improved seed is lower at 9.6kg/kg N. This is ascribed to decreasing returns to fertilizer use, although the decrease sets in at surprisingly low observed fertilization levels (i.e., 33–66kg nitrogen per hectare compared to recommended rates of 100kg nitrogen/ha and above). Two studies by Ricker-Gilbert and Jayne (2011; 2012) evaluate response rates over time and for repeated fertilizer application, as well as across household welfare groups. Although their analysis does not control for seed type, their empirical estimates suggest much lower nitrogen response rates than those assumed by Dorward et al. (2008). For example, access to fertilizer in the current year has a nitrogen response rate of 6.4kg/kg N in the current year. The response rate increases to 12.3kg/kg N if beneficiaries had access to subsidized fertilizer in three consecutive years, which points at significant gains from nutrient build-up and increased efficiency in fertilizer application over time (Ricker-Gilbert and Jayne 2011). Ricker-Gilbert and Jayne (2012) find that response rates are higher for wealthier households; for example, at the 10th percentile of the maize production income distribution the nitrogen response rate is only 2.9kg/kg N compared to 10.1kg/kg N at the 90th percentile.

Funding considerations

The cost of FISP and the financial sustainability thereof has always been a matter of concern to both policymakers and independent program evaluators. Program costs for a selected few years reveal how actual costs have vastly exceeded planned costs, especially in 2008/09 when fertilizer prices almost doubled (see Table 2.1). Donors have traditionally contributed around ten percent of the program cost, and have chosen to focus only on certain aspects of the program, including seed costs, voucher printing costs, the *Logistics Unit* costs, and an element of the transport costs (Logistics Unit 2007). The government's main cost item has always been fertilizer costs, something which most donors have been reluctant to support directly. Around one-fifth of government's cost was recovered through collection of coupon redemption payments during the first years of implementation. However, since the redemption price was never linked to the fertilizer price, government was only able to claw back one-tenth of its expenses from farmers in 2008/09.

⁵ Personal communication, February 20, 2012.

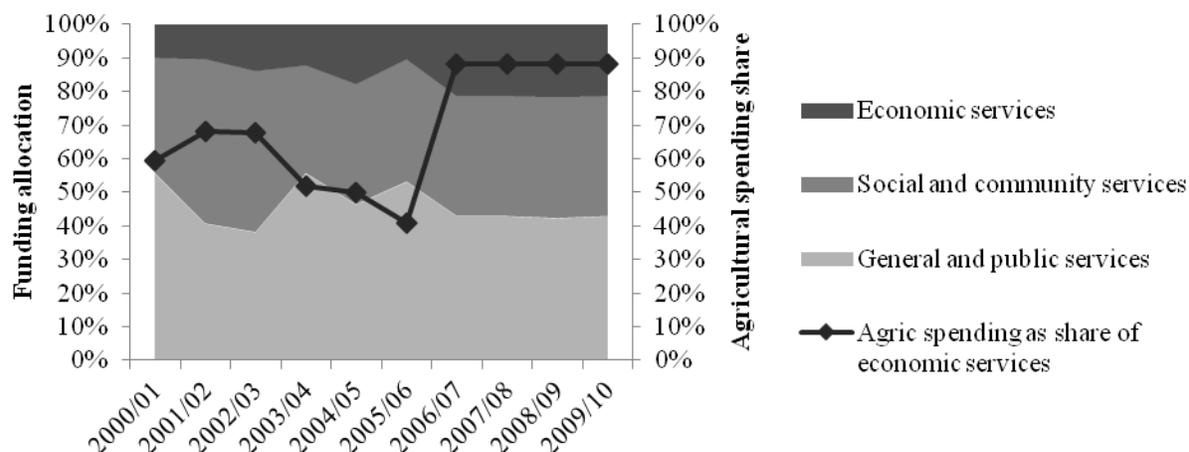
Table 2.1 FISP costs (2006/07–2008/09)

	2006/07		2007/08		2008/09	
	Planned	Actual	Planned	Actual	Planned	Actual
Cost and funding sources (US\$, million)						
Government	51.4	81.4	73.6	109.6	127.0	227.8
Donors	12.5	9.5	5.7	7.1	12.1	37.8
Total cost	53.6	90.9	82.1	116.8	139.1	265.4
Voucher redemption		73.9		95.4		242.3
Budget and GDP shares (%)						
Share of agricultural budget	43.0	61.0	51.0	61.0	61.0	74.0
Share of national budget	5.4	8.4	6.7	8.9	8.5	16.2
Share of GDP		3.1		3.4		6.6

Source: Dorward and Chirwa (2011a)

As a share of the agricultural budget FISP costs increased from 61 percent in 2006/07 to 74 percent in 2008/09. By this time it also made up 16.2 percent of the national budget. Official public financial statistics tell a similar story (Figure 2.1). Although the main budget item shares (i.e., spending shares on economic services, social and community services, and general and public services) remained remarkably constant during the FISP implementation period, agricultural spending as a share of economic services grew dramatically from 41 percent in 2005/06 to 88 percent from 2006/07 onwards. This required a major reallocation across items within the economic services functional classification, with especially large cuts either in real or relative terms in transport and communication services, physical planning and development, commerce and industry, labor relations and tourism services, scientific and technological services, and tourism affairs and services. Budgets for environmental affairs protection and other economic services all but disappeared, while energy and mining services continued to grow, albeit at a fraction of the rate agricultural spending growth.

Figure 2.1 Public Financial Statistics: 2000/01–2009/10



Source: NSO (2011)

Within agriculture the concerning aspect is the inevitable decline in spending on agricultural research, extension services, and training, and even infrastructural spending on rural roads and infrastructure that came about as a result of FISP. The opportunity cost has been the delay in the implementation of other important programs, such as the Greenbelt Initiative (GBI), a planned large-scale

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irrigation scheme that incorporates elements of development, technology adoption, agro-processing, and marketing. As Minot and Benson (2009) warn, a “fertilizer subsidy program, even a well-designed one, cannot substitute for a broad-based program of public investment in agricultural research and extension and in infrastructure development, particularly roads, combined with a policy environment that facilitates private-sector development”.

Cost-benefit estimates

Several studies have attempted to compare benefits of FISP against the costs of implementing the program. These analyses can be conducted either at the household-level or at the economywide level. Perhaps the most frequently quoted set of economywide cost-benefit ratios are those estimated as part of the official program evaluation (Dorward et al. 2008). Based on assumptions about grain-fertilizer response rates, the displacement of commercial fertilizer, the contribution of improved maize seed to aggregate output, maize prices, and weather conditions, Dorward et al. estimate benefit-cost ratios ranging from 0.76 to 1.36. On the balance, when key variables take on “average” or more favorable levels, the benefit-cost ratio exceeds one thus indicating a positive return on investment. Importantly, Dorward et al. (2008) do not consider general equilibrium or spillover effects into other sectors.

Ricker-Gilbert and Jayne’s (2011) focus their attention at the household-level by comparing the value of the incremental crop produced with the cost of the subsidized fertilizer. They find that every 1kg subsidized fertilizer received leads to a US \$1.16 increase in net value of rainy-season crop production. The fertilizer is acquired by government at a full retail price of US \$0.55–0.90/kg during panel period minus the redemption price which ranged from US \$0.10–0.15/kg.

Filipsky and Taylor (2012) evaluate the efficiency of the input subsidy in Malawi at the rural and household level (on six different rural household types) with a rural economy model of Malawi. They find that household-level efficiencies for targeted household groups are higher than overall rural level efficiency, households that are net sellers of labour benefiting from higher wages in addition to the transfer itself. Furthermore, they estimate an average efficiency of the FISP of 0.66 in perfect market conditions which rises at 1.59 when assuming unemployment and constrained input use.

Policy alternatives: social cash transfers

Since, program evaluation are only truly useful when compared to alternative programs, we compare the fertilizer subsidy program of Malawi against an alternative policy aiming for the same objective with similar budget. The primary objective of FISP is to ensure food security in Malawi. Whether this principally implies food self-sufficiency at the national or household-level is less clear. National food self-sufficiency need not necessarily imply that every individual household is food self-sufficient (e.g., a few highly productive commercial farmers can provide for the needs of many smallholders who fail to meet their own food consumption needs; see Dorward et al. 2009).

Some countries, such as Tanzania (Pan and Christianensen 2012), specifically target producers with the higher marginal productivity, which it is an economically efficient way of achieving food self-sufficiency at the national level. Vulnerable households are expected to still benefit indirectly from higher maize production either as a result of increased demand for labor, lower maize prices, and a stable maize market. Efficiency gains can also free up resources that could be used to assist vulnerable households in other ways, particularly complementary social protection programs.

The fact that the Malawi program, in theory at least, targets the most vulnerable households, seems to suggest that food self sufficiency at the household level is the ultimate implied objective. These households are, however, also typically less efficient; hence, targeting the most vulnerable may come at the expense of the overall efficiency of the program (Ricker-Gilbert and Jayne 2012). It is therefore not immediately clear that the preferential access given to the most vulnerable labor constrained households such as the child-headed households or the elderly is in the interest of efficiency at the national level. This

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raises the question whether or not other social protection programs might be more efficient at addressing various forms of deprivation among the poor.

Social protection has gained momentum both on the international and national development agendas since the turn of the millennium. These policies are broadly designed to protect people, households, and communities against shocks and risks. Social protection is also seen as one of the key ways of ensuring the attainment of the Millennium Development Goals, especially food security and poverty reduction goals (HLPE 2012). Compared to policies that provide in-kind or subsidized benefits that require transportation and storage of physical goods, cash transfers are relatively easy to administer. Public works programs, in turn, require supervision and equipment.

Cash transfer and input subsidy programs differ fundamentally in terms of their design and implementation. Firstly, while both aim to address liquidity constraints faced by the poor, cash transfers provide more freedom to recipients in terms of the spending choices they have. However, cash transfers do not necessarily only have consumption effects; recipients may choose to use cash transfer income to invest in productive activities (e.g., crop production), thereby having a very similar outcome to an input subsidy. Secondly, fertilizer subsidies by nature only target farm households. Cash transfers, on the other hand, can be targeted at farm or non-farm households. A particular shortcoming of FISP, for example, is the fact that landless rural households are excluded. Thirdly, as a type of production subsidy, fertilizer subsidies directly promote domestic production activities and raise value-added in the economy, which suggests a large multiplier effect compared to cash transfers. For this reason they could be regarded as more sustainable than cash transfers, which principally promote domestic production indirectly via the consumption channel. Depending on marginal spending propensities, at least part of additional income earned by households from cash transfer schemes is “leaked” from the economy in the form of imports.

Malawi already has a Social Cash Transfer Scheme (SCTS) in place. It was designed as a tool within the National Social Welfare Policy in response to widespread poverty and hunger (National Social Protection Technical Committee, 2007). Following the success of the pilot scheme in 2010, the Social Cash Transfer Scheme (SCTS) was scaled up to seven districts in Malawi, reaching more than 83,000 households and funded by various development partners operating in Malawi. A small share of the cost is covered by the Malawian government (Miller et al. 2011). The SCTS objectives are to improve food security by targeting transfers to the country’s most destitute households (Schubert and Kambewa 2006). There are no formal, monitored conditions that accompany the transfer, but recipients are urged to use grants to purchase a variety of healthy foods, fertilizer, and farm tools, and to direct a portion of their harvest to food stores. According to Miller et al. (2011), the eligibility criteria include being classified as ultra-poor and being labor-constrained. The ultra-poor include the poorest 10 percent of households that own little or no assets and often consuming only one meal per day. Households with a dependency ratio of three or higher are defined as labor constrained. Dependents include children (under 19), the elderly (65 and above), or other household members with chronic illnesses or disabilities that render them unable to work. The cash transfer ranges from US \$4.29 to \$22 per month and accounts, on average, for up to 60 percent of per capita expenditures in recipient households (Miller et al. 2011). Impact evaluations show that SCTS beneficiaries also purchase livestock and other productive assets such as farming equipment and fertilizer coupons (Miller 2009). Miller et al. (2011) evaluate the impacts on food security and dietary diversity and find evidence that the Malawi SCTS provides the income necessary for households to increase food expenditures in absolute and relative terms.

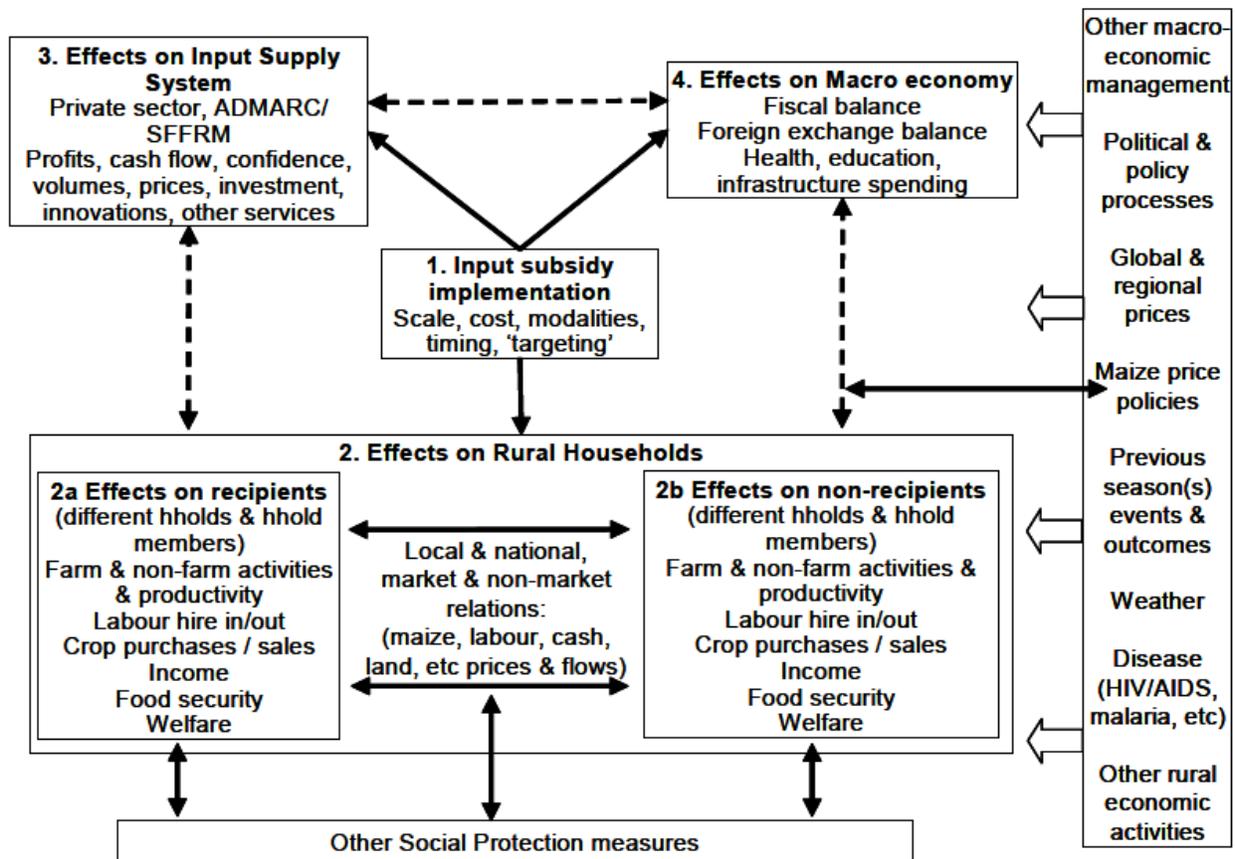
To our knowledge, this program has not been thoroughly compared to the FISP, despite the fact that they have similar objectives, are partly targeting the same households and have common funders. Filipinski and Taylor (2012), is the only exception. They find that with a perfect market model, cash transfers have the highest multiplier, but input subsidies can be the most welfare efficient transfer scheme when input demands are constrained by limited liquidity prior to the harvest. However, in their study Filipinsky and Taylor neither look at the linkages between rural and urban household and the impacts on food and labor prices, neither on the macroeconomic impacts of the programs, in terms of the fiscal balance, exchange rate effects, and changes in government spending. Our study will complement theirs by providing estimates on those different elements.

3. MODEL, DATA, AND SIMULATION DESIGN

Model, data, and closure rules

Dorward et al. (2008) provide an analytical framework for agricultural input subsidy program evaluation. This framework is highly relevant to our analysis here (see Figure 3.1). At the heart of the framework is the input subsidy implementation (1), which directly affects rural households (2). Among these households we find recipient households (2a) whose agricultural activities are directly influenced by the subsidy. Depending on markets and linkages among rural households, non-beneficiary households (2b) may be affected indirectly through, for example, increased labor demand or declining crop prices. Crop price movements will have differential effects on net sellers and net consumers. Other social policy (e.g., cash transfers) may also impact directly on recipient or non-recipient households and therefore also influence the interaction effects between these two classes of households.

Figure 3.1 Conceptual framework for investigating the impacts of the fertilizer subsidy



Source: Dorward et al. (2011)

The subsidy program will also have direct implications for the input supply system (3), either as a result of direct demand for inputs or displacement effects. Here the interaction effects between the input system and households as demanders of inputs are potentially important. The macro-economy (4), in turn, will be affected via the fiscal balance, exchange rate effects, and changes in government spending. Aggregate household spending also has implications at the macroeconomic level. Finally, various external factors listed in the box to the right of the figure will also affect the outcome of the policy.

In this study we use a computable general equilibrium model for Malawi to evaluate the economywide effects of FISP under various assumptions about program design, economic behavior, and

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external shocks. CGE models are designed specifically to capture the kinds of linkages between agents, sectors, and markets identified in Figure 3.1 and are therefore ideal for assessing the economywide impacts of large-scale policies. The model is calibrated to a newly developed social accounting matrix (SAM) for Malawi. We purposefully select a base-year of 2003/04 for the model, which represents the last “normal” year prior to the implementation of FISP in 2005/06 as far as agricultural production, policy, and weather is concerned. The model includes 58 economic sectors, including 26 in agriculture. We incorporate four “FISP sectors” which facilitate the phasing in of the input subsidy program. These include two subsidized maize sectors in which composite and hybrid seeds are used respectively. We also include a new seed sector that exclusively supplies subsidized seed for the FISP. Finally, an additional fertilizer sector is through which imported fertilizer for the subsidy program is channeled. Commercial fertilizer continues to be supplied by the traditional fertilizer sector at unsubsidized prices.

A key feature of CGE models is that producers in each sector maximize profits when combining intermediate inputs with land, labor, and capital. Agricultural land includes small-, medium-, large-scale, and estate land; capital is disaggregated into agricultural and non-agricultural capital; and labor is split into five classes denoting educational attainment as proxy for skill level. All factors are assumed to be fully employed and mobile across economic sectors in which they can potentially be employed. The only exception is the FISP maize sectors, which we assume get allocated a fixed area of land so that we can exactly replicate the production impacts of FISP. In all sectors production is specified by a constant elasticity of substitution (CES) function that allows for imperfect substitution between factors of production, while intermediate inputs are demanded in fixed proportions to the level of output (Leontief). These general principles of profit maximization also apply to the FISP sectors, although as noted they are constrained in terms of land use. The technical specification of the FISP sectors is explained in more detail in the simulation design section below.

Household income and expenditure patterns are important for determining how economic shocks affect households in the model. The model identifies rural non-farm and farm households as representative groups, with the latter disaggregated by land size (small, medium, and large-scale farm households). Urban households are also disaggregated into farm and non-farm households. All household groups are further disaggregated by income quintile, thus giving a total of 30 households in the model. Factor incomes are distributed among households based on their initial factor endowments. Households save and pay taxes, and the balance of income is used for consumption expenditure. Consumption patterns are based on a linear expenditure system (LES) of demand, which allows for non-unitary income elasticities and fixed marginal budget shares. Income elasticities determine the responsiveness of demand for different household consumption items to real income changes.

Household poverty is affected through both income (employment) and expenditure (price) channels. For example, when agricultural production and revenues expand, households that derive income from land ownership and on-farm employment are more likely to benefit. However, revenues may not increase if producer prices fall sufficiently. Falling prices, in turn, benefit consumers, particularly nonfarm households, but also net-consuming farm households (i.e., those producing less than they consume). The use of aggregate household groups in CGE models prevents a nuanced analysis of the differential poverty effects on households. The Malawian model therefore incorporates a poverty module in which changes in prices and consumption at the representative household group level (i.e., as observed in the CGE model) are linked to corresponding member households in the underlying survey data, where changes in standard income poverty measures are computed.

A government sector and an account capturing savings and investment flows make up the remainder of “domestic” components in the model. Government collects direct and indirect taxes (note a subsidy is modeled as a negative indirect tax) and incurs normal government consumption expenditures. Net government savings either contribute to or reduce the pool of savings in the economy depending on whether there is a budget surplus or deficit. We assume government adjusts direct or indirect tax rates to ensure that net savings remain fixed. Other sources of savings include household savings—they are assumed to save a fixed proportion of their income—and foreign savings. Investments in the model are determined by the amount saved (i.e., a savings-driven investment closure).

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Economic outcomes are also affected by trade and movements in market prices. The standard CGE model assumes that producers supply their output to national product markets. Transaction costs separate producer and national consumer prices. International trade is modeled by allowing production to shift imperfectly between domestic and foreign markets depending on the relative prices of exports and domestic products. This is governed by a constant elasticity of transformation (CET) function. Similarly, a CES function is used to model consumers' choice between imported and domestically supplied goods, which depends on relative import prices. Malawi is a small economy and generally cannot exert any market power in world markets. We therefore adopt a so-called “small country assumption” whereby prices for imports and exports are fixed, unless changed exogenously as part of a simulation experiment.

Traditionally, in standard CGE models, the current account balance is maintained either via a flexible exchange rate or flexible foreign savings. In this study we follow Pauw et al. (2012) in adding a third closure option representing a fixed exchange rate policy option with foreign exchange rationing. Under this closure neither the exchange rate nor foreign savings can adjust; hence, an additional variable representing the parallel exchange rate (or “black market” rate) has to be added to the model. Whenever there is excess demand for foreign exchange (e.g., this will happen when demand for fertilizer increases as a result of the subsidy program) the parallel exchange rate rises above the official exchange rate. The parallel exchange rate is used to value imported goods sold locally as these are no longer valued at the official exchange rate. Those with access to foreign exchange at the official rate extract the premium as a windfall gain. Typically those with political or business connections are more likely to extract the premium (see Dorosh and Sahn 2000). We assume the distribution of the premium value across households follows the distribution of transfer income from incorporated business enterprises to households in the base (i.e., this is highly biased towards high-income households in the model who possess the business connections required to extract the premium). Exports are still valued at the (lower) official rate, which means exporters in particular experience a cost price squeeze as a result of the policy. In contrast to a flexible exchange rate regime where the burden of adjustment is shared between exports and imports, the burden of adjustment in the external account is entirely on exports when a fixed exchange closure is used (Dervis et al. 1982).

All the simulations are conducted in a comparative static fashion in which the simulated outcome under FISP is compared against the baseline or pre-FISP situation. For a more detailed discussion of the features of the Malawi model, refer to Benin et al. (2008). The IFRI standard model is also described in detail in Löfgren et al. (2001).

Simulation design

The Malawian CGE model had to be adapted in various ways in order to simulate the impact of FISP. This principally involved building various “new” sectors into the model which either produce subsidized maize or supply subsidized inputs (seed and fertilizer). Initially these sectors are very small. We then exogenously allocate farm land to the FISP maize sectors in order to “kick-start” production. When a new sector is introduced in this manner it is important to carefully structure the technology vectors in the new sectors so that once they expand their demand for primary and intermediate inputs reflects expectations. The FISP maize sectors, for example, are designed to exactly replicate the actual subsidy program as far as seed and fertilizer input use is concerned once the sectors are fully operational. FISP fertilizer is fully imported and subsidized by government via a negative sales tax. FISP seed is also supplied by a distinct seed sector and is fully paid for by government (i.e., this is a free input). FISP maize is assumed to be substitutable with maize produced by the traditional maize-growing sector.

The simulations are loosely styled on the features of the 2006/07 program. We assume that 60 percent of seed supplied is hybrid. We allocate 750,000ha to the FISP maize sectors, which endogenously causes a 150,000mt increase in subsidized fertilizer imports, based on an assumption that beneficiary farmers apply 200kg fertilizer per hectare (i.e., 66 kg nitrogen/hectare). The fertilizer subsidy rate is set at 72 percent, with the balance of the cost representing the redemption price paid by farmers. Yields in the subsidized sectors are based on an average nitrogen response rate of 15kg/kg N following Dorward et al.

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(2008). Also, whereas the traditional maize sector includes lower-yielding local maize varieties, the subsidized sector only uses composite or hybrid varieties. Average yields in the subsidized sector are therefore around 50–60 percent higher than in the traditional sector.

Importantly, we do not (and cannot) target the subsidy on households directly but rather stimulate production through allocating part of the pool of existing land to the subsidized sector. All households benefit indirectly through increased demand for labor and returns to land. The pre-subsidy factor income distribution matrix determines how factor incomes are distributed across households. In that sense, we do not model a targeted subsidy program but rather a universal subsidy program (albeit excluding estates).

We model three sets of simulations (see Table 3.1). In the first we run various “basic” FISP simulations to evaluate program impacts at the economywide level under different funding models. The first simulated (named *fispd*) assumes the program is entirely donor-funded. The second and third simulations (*fispgn* and *fispgp*) assume the program is funded entirely by government, either through raising indirect taxes such as sales taxes and import duties (“neutral” financing) or raising direct income taxes (“progressive” financing). These simulations are designed to capture the full opportunity cost of the program in the event that no donor support is received. Finally, we model an “actual” FISP scenario where the program is funded jointly by donors and government. In 2006/07, for example, donors funded 53 percent of transport costs and 87 percent of logistics costs, while government covered the balance of those cost components as well as the full cost of the fertilizer net of the redemption price. On average, therefore, donors contributed 24 percent of the FISP cost in that year, which is also the average share we assume in our jointly funded scenarios. The government share of the costs is once again funded either through indirect (“neutral”) or direct (“progressive”) taxes (*fispjn* and *fispjp*).

The second set of simulations considers external shocks (risk factors) and exchange rate regimes. We start out by rerunning the jointly-funded FISP scenario with indirect taxes, but adopt a foreign account closure with a fixed exchange rate and foreign exchange “rationing” (*fispjnr*). In terms of this closure both the exchange rate and foreign capital inflows are fixed. When demand for foreign exchange increases (e.g., as a result of increased demand for imported fertilizer under FISP), the exchange rate does not depreciate but a parallel or “black” market exchange rate emerges where scarce foreign exchange trades at a premium over the official rate. All importers have to pay the premium rate, while increased costs are passed on to consumers. We assume, however, that government procures FISP fertilizer at the official exchange rate; hence a fixed exchange rate policy allows government to hedge the cost of FISP against adverse exchange rate movements, albeit at the expense of the export sector in particular.

We next evaluate the outcome under two external shocks, namely an increase in fuel and fertilizer prices and a decline in tobacco prices. The period 2004–2008 was characterized by extreme price increases for key commodities. Fuel prices increased by almost 180 percent during this period, while fertilizer prices increased by a staggering 370 percent (Heady and Fan 2011). The biggest spike in fuel and fertilizer prices occurred in 2008. This had a major impact on Malawi’s FISP: between 2007/08 and 2008/09 the face value of fertilizer vouchers increased from about MKW3,300 to MKW7,950 (141 percent), while overall program costs increased by 154 percent compared to budgeted increases of only 69 percent (Dorward and Chirwa 2011). Our “fuel and fertilizer” price scenario therefore assumes a 140 percent rise in import prices for these commodities. Tobacco is a major export earner for Malawi. A major contributing factor to the foreign exchange crisis has been the slump in tobacco export prices. In 2010 export values declined by 31 percent compared to 2009. Both export volumes and prices declined in that year (i.e., by 14 and 20 percent respectively) (NSO 2011). An even larger shock occurred in 2011 when prices plummeted by almost 35 percent compared to 2010 (TCC 2011). Export volumes were unchanged compared to the previous year, but the decline in export earnings was larger. Our tobacco simulations assume a 20 percent decline in export prices for both primary and processed tobacco products in an attempt to simulate the shock experienced in 2010.

For both these sets of simulations we first evaluate the impact of the price shock by itself (i.e., in the absence of FISP) and under flexible (hypothetical) and fixed (actual) exchange rate regimes to evaluate impact on the balance of payments (*fert* and *fertr*; *tob* and *tobr*). We then combine the individual shocks with FISP and once again solve the model under the two exchange rate closures (*ffert* and *ffertr*; *ftob* and

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ftobr). In each instance, the primary shock is expected to either lead to an exchange rate depreciation (flexible exchange rate closure) or a comparatively larger increase in the parallel exchange rate (rationing closure). Note it is common for the parallel rate adjustment to be much higher than the exchange rate adjustment required to bring about equilibrium in the demand and supply of foreign exchange (see Pauw et al. 2012). FISP costs increase directly when fertilizer prices increase, or indirectly when the exchange rate depreciates as a result of the modeled price shocks. Government can therefore use the exchange rate regime to control for the indirect (exchange rate-linked) costs. However, but as explained, a fixed exchange rate regime comes at the expense of other sectors and the income distribution in the economy.

Table 3.1 Modeled simulations

Description		Funding source	Taxation	Exchange rate rationing	Fertilizer & petroleum prices	Tobacco prices
<u>Basic FISP simulations and funding models</u>						
<i>fispd</i>	<i>FISP donor funded</i>	Donors	N/A			
<i>fispgn</i>	<i>FISP government funded (neutral)</i>	Gov.	Neutral			
<i>fispgp</i>	<i>FISP government funded (progressive)</i>	Gov.	Progressive			
<i>fispjn</i>	<i>FISP jointly funded (neutral)</i>	Joint	Neutral			
<i>fispjp</i>	<i>FISP jointly funded (progressive)</i>	Joint	Progressive			
<u>Risk factors and exchange rate regimes</u>						
<i>fispjnr</i>	<i>FISP jointly funded (neutral) with rationing</i>	Joint	Neutral	Yes		
<i>fert</i>	<i>No FISP, 140% fertilizer & fuel price increase</i>		Neutral		140%	
<i>fertr</i>	<i>No FISP, 140% fertilizer & fuel price increase</i>		Neutral	Yes	140%	
<i>ffert</i>	<i>FISP plus 140% fertilizer & fuel price increase</i>	Joint	Neutral		140%	
<i>ffertr</i>	<i>FISP plus 140% fertilizer & fuel price increase, with exchange rate rationing</i>	Joint	Neutral	Yes	140%	
<i>tob</i>	<i>No FISP, 20% tobacco price decline</i>		Neutral			-20%
<i>tobr</i>	<i>No FISP, 20% tobacco price decline</i>		Neutral	Yes		-20%
<i>ftob</i>	<i>FISP plus 20% tobacco price decline</i>	Joint	Neutral			-20%
<i>ftobr</i>	<i>FISP plus 20% tobacco price decline, with exchange rate rationing</i>	Joint	Neutral	Yes		-20%
<u>Policy alternatives: cash transfers</u>						
<i>uctg</i>	<i>Universal cash transfer government funded</i>	Gov.	Progressive			
<i>tctg</i>	<i>Targeted cash transfer jointly funded</i>	Gov.	Progressive			
<i>uctj</i>	<i>Universal cash transfer government funded</i>	Joint	Progressive			
<i>tctj</i>	<i>Targeted cash transfer jointly funded</i>	Joint	Progressive			

A final set of simulations consider the impact of an alternative social policy, namely cash transfers. We assume the cash transfer scheme has the exact same budget as FISP, while the program is either fully funded by government or jointly funded by government and donors, with the latter contributing the same share as they do towards FISP. The government contribution is either financed via an increase in direct taxes on household income, or via a progressive tax system, which, means that those at the upper end of

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the income distribution will experience a net decline in their disposable income. We model two types of schemes. Under the universal grant scheme each Malawian receives the exact same grant (*uctg* and *uctj*). We also model a targeted cash grant where only individuals in the poorest 60 percent of the income distribution receive the grant. Once again the per capita transfer is the same for all beneficiaries (*tctg* and *tctj*). Of particular interest in these scenarios is the extent to which the scheme stimulates production (as a result of increased demand) and improves welfare (disposable incomes and poverty) relative to FISP. This set of simulations is by no means meant to be an exhaustive analysis of cash transfers, but merely generates some broad comparative estimates against which FISP can be compared.

4. RESULTS AND DISCUSSION

Program design and costs

We start by presenting a summary of program costs under various assumptions. While our basic program design is closely styled on the actual fertilizer distribution under the 2006/07 program, we consider outcomes under various funding regimes. As shown in Table 4.1 program costs under these “basic” FISP scenarios vary from MK7–7.2 billion (2003 prices). Variations in costs across the simulations are due to fluctuations in the exchange rate (see Table 4.2). While the increased demand for imported fertilizer generally causes the exchange rate to depreciate, the inflow of foreign exchange under the donor-funded program more than offsets foreign exchange outflows and causes the exchange rate to appreciate; hence, imported fertilizer becomes cheaper and the overall program costs decrease relative to the government- or jointly funded scenarios. Costs are highest when fully funded by government since there are no additional foreign exchange inflows to cushion the exchange rate depreciation associated with rising fertilizer imports. We consider outcomes under a flexible and fixed exchange rate regime for the jointly-funded program. Under the flexible exchange rate regime the exchange rate depreciates slightly, and hence costs are higher than in the fixed exchange rate scenario. During much of the FISP implementation period government did indeed fix the exchange rate. This, as our results show, has provided a mechanism through which FISP costs could be contained to some extent.

Table 4.1 Overall program costs

	Basic FISP scenarios				FISP and risk factors (jointly funded)			
	Donor-funded, flexible exch. rate	Govt.-funded, flexible exch. rate	Jointly funded		Fertilizer and fuel price shocks		Tobacco price shocks	
			Flexible exch. rate	Fixed exch. rate	Flexible exch. rate	Fixed exch. rate	Flexible exch. rate	Fixed exch. rate
Total program cost	7,025	7,202	7,165	7,112	17,750	16,500	8,259	6,838
<i>Comparable cost in 2006/07 (*) or 2008/09 (**)</i>				<i>11,237[†]</i>		<i>36,829[‡]</i>		
Inputs	6,423	6,600	6,563	6,510	17,148	15,898	7,657	6,236
Donors	6,423		1,357	1,346	1,435	1,292	1,574	1,138
Government		6,600	5,207	5,164	15,713	14,606	6,083	5,097
Logistics and transport	602	602	602	602	602	602	602	602
Donors	602		363	363	363	363	363	363
Government		602	239	239	239	239	239	239
Cost as share of GDP (%)	2.9	3.0	3.0	2.9	8.6	7.9	3.6	2.9
Farmers' costs (voucher redemption)	1,975	1,975	1,975	1,975	1,975	1,975	1,975	1,975

Source: CGE model results

Notes: In all scenarios government raises funding for the program by raising indirect taxes. We report on scenarios with direct taxation (income tax) further below. Program costs are reported in 2003 prices. Dorward and Chirwa (2011) report program costs as follows: MK7,500 million (planned) and MK12,729 million (actual) in 2006/07 (latter is 3.1 percent of GDP). In 2008/09 a somewhat larger program (i.e., 180,000mt fertilizer instead of 150,000mt) was budgeted to cost MK19,480 million, while actual cost amounted to MK39,847 or 6.6 percent of GDP. Relative to 2003, the CPI index rose 47 percent by 2007 and 86 percent by 2009. After adjusting for prices ([†]) and prices/program size ([‡]) our cost estimates are comparable to the actual outcome.

Given the careful simulation design our modeled program costs are comparable, in real terms, to the actual costs incurred during the 2006/07 program. The jointly-funded fixed exchange rate scenario probably most closely represents the actual program cost and outcome. Dorward and Chirwa (2011) report actual program cost for that year as MK11,237 million. If we adjust our estimate of MK7,112

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million for inflation—by 2007 prices rose 47 percent relative to 2003—our cost estimate is close to the actual cost (see table footnote for details).

The bulk of program cost is made up of fertilizer input costs, which we assume is always fully paid for by government in the jointly-funded scenarios. Donors contribute fixed shares of transport and logistics costs, and essentially cover the full cost of the seed component of the program. When fertilizer prices rise, government’s share of the costs rises proportionally. Fertilizer prices rose by 140 percent in 2008/09. When we model a similar shock our program cost under the fixed exchange rate regime rises to MK16,500 million, which is comparable with the actual outcome in 2008/09 once we control for the fact that that particular program was slightly larger in size and that prices, by then, were 86 percent above 2003 levels (see table footnote). Under a flexible exchange rate regime program costs would have been higher due to the exchange rate depreciation, which in this instance is much higher than before given the increased cost of imported fertilizer. We also model the effect of a tobacco price decrease. This impacts the FISP cost indirectly via an exchange rate depreciation (tobacco is a major export product for Malawi). Costs rise to MK8,259 under the flexible exchange rate closure, but are contained when the exchange is fixed. We discuss the implications of a fixed exchange rate regime on the rest of the economy further below.

In all the “basic” scenarios we assume farmers pay a redemption price equivalent to less than 30 percent of the total program cost. As discussed earlier, this redemption price was never linked to actual fertilizer prices; hence, when fertilizer prices increase we find that this redemption price drops to around 12 percent of program cost. This causes the cost burden on government and donors to increase.

Economywide effects under the “basic” FISP scenarios

Table 4.2 reports on GDP outcomes for our “basic” FISP scenarios. All the scenarios assume a flexible exchange rate but funding mechanisms vary. In instances where government is required to raise additional funding, either indirect or direct taxes are raised. When fully funded by donors the program has a strong impact domestic absorption, which grows by 3.4 percent. Absorption is a useful measure of overall domestic welfare and is defined as the sum of government spending, private household consumption, and current investment. Overall GDP, however, only expands 1.1 percent, which points at a worsening trade balance. The appreciation of the exchange rate means that much of the increased spending is on imported goods, while export sectors become less competitive and hence export less in real terms. In sharp contrast, when government has to finance the program, the exchange rate appreciates sharply causing exports to improve and imports to be constrained. At the same time, the increase in taxes means lower disposable incomes and hence domestic absorption rises by only 0.9 percent, irrespective of how the program is financed (i.e., indirect or direct taxes). Interestingly, however, national GDP expands by one percent, which is very close to the growth under the donor-funded scenario.

Table 4.2 GDP at market price: “basic” FISP scenarios

	Initial value (MK billions) (2003)	Percentage change in GDP at market prices: Basic FISP scenarios				
		Fully funded by donors	Government-funded		Jointly funded by donors and government	
			Indirect taxes	Direct taxes	Indirect taxes	Direct taxes
Domestic absorption	266.1	3.4	0.9	0.9	1.4	1.4
Exports	60.4	-2.0	4.9	4.6	3.5	3.3
Imports	-91.1	5.8	3.3	3.1	3.8	3.7
GDP at market prices	235.4	1.1	1.0	1.0	1.1	1.0
<i>Exchange rate appreciation (–) or depreciation (+) (%)</i>		<i>-1.34</i>	<i>1.06</i>	<i>2.60</i>	<i>0.57</i>	<i>1.76</i>

Source: CGE model results

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The actual FISP is jointly funded by government and foreign donors. GDP outcomes under these scenarios lie somewhere in between the two “extreme” funding scenarios; GDP expands by around one percent and absorption by 1.4 percent. Both exports and imports rise, the latter owing to rising fertilizer imports and the former to the exchange rate depreciation. Generally, as far as GDP aggregates are concerned, the funding regime (i.e., direct or indirect taxation) has little impact on results, although the exchange rate depreciates by more when direct taxes are used as funding mechanism.

Table 4.3 is complementary to the above and provides a sectoral breakdown of GDP. Here GDP is measured at factor cost (i.e., value added). At the aggregate level the difference between GDP at factor cost and market prices is indirect taxes. FISP clearly has a strong impact on maize production, irrespective of how it is funded. We find that the national average maize yield increases from 1.32 to 1.74mt/ha, while around 250 000mt of additional maize is produced. Value added in the maize sector increases significantly more than output (i.e., around 36 percent) due to increased factor returns, including wages and returns to agricultural land which is used more intensively. Growth in the maize sector also drives overall agricultural growth, while export sectors contribute significantly to agricultural growth in those scenarios where government partly or wholly funds the program internally.

Table 4.3 GDP at factor costs, by sector: “basic” FISP scenarios

	Initial value (MK billions) (2003)	GDP shares (%) (2003)	Agric. GDP shares (%) (2003)	Percentage change in GDP at market prices				
				Fully funded by donors	Government-funded		Jointly funded	
					Indirect taxes	Direct taxes	Indirect taxes	Direct taxes
Total GDP	220.9	100.0		4.1	4.1	4.0	4.1	4.1
<u>Agricultural sub-sectors</u>	<u>72.7</u>	<u>32.9</u>	<u>100.0</u>	<u>13.5</u>	<u>14.0</u>	<u>14.0</u>	<u>13.9</u>	<u>13.9</u>
Cereals	24.1	10.9	33.2	32.8	31.4	32.3	31.7	32.4
<i>Maize</i>	20.4	9.3	28.1	37.0	35.9	37.0	36.1	37.0
Root crops	2.1	0.9	2.9	8.6	6.2	6.3	6.7	6.8
Pulses, nuts, oilseeds	9.5	4.3	13.1	11.5	10.4	9.6	10.6	10.0
Horticulture	9.6	4.3	13.2	8.1	4.1	4.8	5.0	5.5
Export-oriented crops	13.8	6.2	18.9	-1.0	9.1	8.1	7.0	6.2
Livestock	8.9	4.0	12.3	-0.1	-1.2	-1.7	-1.0	-1.4
Other agriculture	4.7	2.1	6.5	-0.3	-1.5	-1.7	-1.3	-1.4
<u>Industry</u>	<u>38.0</u>	<u>17.2</u>		<u>-0.6</u>	<u>-1.0</u>	<u>-0.8</u>	<u>-0.9</u>	<u>-0.7</u>
Mining	2.6	1.2		-0.1	-1.5	-1.3	-1.2	-1.0
Manufacturing	25.6	11.6		-0.8	-0.6	-0.3	-0.7	-0.4
<i>Agro-processing</i>	14.9	6.8		-0.4	-0.4	-0.1	-0.4	-0.2
Other industry	9.9	4.5		-0.2	-1.8	-1.8	-1.4	-1.5
<u>Services</u>	<u>110.2</u>	<u>49.9</u>		<u>-0.5</u>	<u>-0.6</u>	<u>-0.8</u>	<u>-0.6</u>	<u>-0.8</u>
Private services	87.8	39.7		0.0	0.0	-0.2	0.0	-0.2
Government services	22.4	10.1		-2.4	-3.0	-3.2	-2.9	-3.0
Incremental maize production (1000mt)	1,983			261	239	260	244	260
Total maize land (1000ha)	1,502			1,291	1,276	1,291	1,279	1,291
Avg. maize yield (mt/ha)	1.32			1.74	1.74	1.74	1.74	1.74
<i>Real maize price index (%)</i>	100			-3.7	-2.3	-1.6	-2.6	-2.1
<i>Real food price index (%)</i>	100			-3.0	-2.3	-1.4	-2.4	-1.7
<i>Average farm wage (%)</i>	100			6.0	2.7	5.9	3.4	6.0

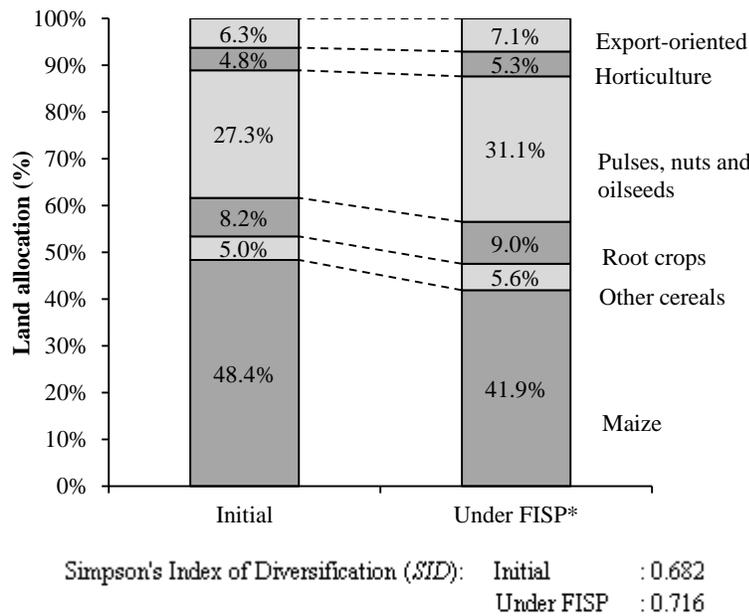
Source: CGE model results

Some important land reallocation effects are observed. As shown in Table 4.3, the maize sector as a whole initially utilizes approximately 1.5 million hectares of land. After the introduction of the subsidy

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around 1.3 million hectares is required in total (this includes subsidized and traditional maize cultivation). Thus, roughly 200,000ha of land (i.e., about six percent of total agricultural land) is reallocated away from maize crops to other crops, partly because enough maize can be produced on less land given higher average maize yields, and partly because declining maize prices mean that traditional (unsubsidized) maize cultivation in particular becomes less profitable relative to other crops (recall that the land allocation to subsidized maize is fixed at 750,000ha, i.e., all land is reallocated away from traditional maize). Declining prices relate to increased maize supply and demand-side constraints in Malawi. Figure 4.1 provides more information on changes in land allocation across crops. Allocations increase to all non-maize crops, which ultimately leads to a higher crop diversification index (i.e., the Simpson’s Index of Diversification) due to a more equal allocation of land.

Figure 4.1. Land reallocation



Source: CGE model results

Note: (*) The jointly-funded FISP scenario with indirect taxes is used here.

In reality, in Malawi, farmers have been allocating more land to maize in spite of the subsidy. Crop diversification has also declined rather than increased. Kankwamba et al. (2012) speculate that this might be due to the fact that more producers in Malawi are switching to maize production away from other staples such as cassava or potatoes in order to become eligible for the subsidy. After all, being classified as a maize producer is the first criterion for accessing the subsidy. Such unanticipated behavioral changes are difficult to model in a CGE framework; thus, while we can conclude that the direct effect of the subsidy is increased crop diversification—this is consistent with Kankwamba et al.’s (2012) finding that FISP *beneficiaries* become more diversified—an indirect effect is for more farmers (i.e., non-beneficiaries in particular) to specialize in maize.

The combined effect of rising (farm) wages and declining maize prices (see Table 4.3) is a decline in poverty (Table 4.4). The decline in urban and rural poverty is fairly similar in percentage-point terms, although the fact that urban poverty is much lower initially means that the decline in urban poverty is larger in relative terms. This is not unexpected. Although FISP is designed to benefit rural households, rising farm wages are partly offset by declining maize prices, which affects income levels of net sellers of maize. While FISP perhaps does not have poverty reduction as a main objective, it is clear to see that the

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program, despite its cost, does not impact hugely on poverty. By 2010/11 Malawi’s official poverty rate had only declined to 50.7 percent. This came as a surprise to many who believed programs such as FISP should have had a more pronounced effect on poverty given its direct effects on maize production. However, once we account for indirect effects of the program we are able to see why it is not that effective at reducing poverty. An important caveat of our modeled results is that we do not explicitly target households; instead, we target an activity, and the benefits from the subsidy are essentially shared among households engaged in that activity via the factor market. This leads to some “dilution” of benefits as it is spread across a wide range of households, including non-poor households, and not necessarily only those that would have been most likely to be targeted under the subsidy.

Table 4.4. Poverty outcomes: “basic” FISP scenarios

	Initial poverty rate	Fully funded by donors	Government-funded		Jointly funded	
			Indirect taxes	Direct taxes	Indirect taxes	Direct taxes
Poverty headcount (P_0)						
<u>National</u>	52.4	-2.4	-1.2	-2.7	-1.4	-2.6
Rural	55.9	-2.3	-1.2	-2.8	-1.4	-2.7
Urban	25.4	-2.8	-1.0	-1.9	-1.2	-2.1
Depth of poverty (P_1)						
<u>National</u>	17.8	-1.1	-0.6	-1.3	-0.7	-1.3
Rural	19.2	-1.1	-0.6	-1.4	-0.7	-1.4
Urban	7.1	-0.8	-0.3	-0.5	-0.4	-0.6

Source: CGE model results

Note: (*) The official poverty estimates for 2004/05 (IHS2) are used as the reference poverty rate for the model baseline (2003).

The funding mechanism adopted has implications for the effectiveness of the program in reducing poverty. The biggest decline in poverty occurs when the program is partly or wholly funded by government and financed via higher income taxes, which are primarily levied on wealthier households. Indirect taxes tend to burden households across the income spectrum, and particularly the poor spend a greater deal of their income on consumption items. In fact, even the donor-funded scenario is less pro-poor than the government-funded scenario with direct taxes, at least at the national level and for rural households. This is due to the adverse effects of the exchange rate appreciation, which causes agricultural exporters in particular to fare worse than they would when the exchange rate depreciates. In general, however, the narrow tax base in developing countries such as Malawi means that progressive taxation is rarely an effective option for financing. For a program the size of FISP, average tax rates have to increase by a significant margin—by around 40–50 percent in our joint or government-funded scenarios—to balance the budget. For this reason developing countries often opt for using indirect taxes as an instrument for raising finance, despite the fact that these are “regressive” in nature.

Risk factors and policy environment

The performance of FISP is affected by the macroeconomic policy environment in which it is implemented as well as external factors such as international price shocks. Until recently Malawi had a fixed exchange rate regime which had important implications for economic performance and foreign exchange availability (see Pauw et al. 2012). The economy was also rocked by a series of price shocks; first, fuel and fertilizer prices increased dramatically in 2008/09; and second, tobacco prices declined sharply in 2009/10 and 2010/11. Both these explicitly or implicitly impacted on foreign exchange availability in the country. In the case of fertilizer prices and the commitment by government to supply a certain quantity of fertilizer, the price hike meant that less foreign exchange was made available to the

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general public for importation of other goods. In the case of the tobacco price collapse, export revenues declined sharply, which meant an explicit decline in foreign exchange supply.

The fact that FISP provides imported fertilizer to a sector that produces what is essentially a non-tradable good (maize) could be considered a major design flaw of the program. The counter argument is that importation of fertilizer is less draining on foreign exchange reserves than the importation of maize that would be required in the absence of the subsidy program. Either way, since no foreign exchange is generated by FISP, it will always be a net negative entry on the balance of payments. The deficit has to be covered by foreign aid inflows or by exporting more. In this section we consider some of the economywide effects of international price shocks and exchange rate policy and how that interacts with FISP.

We first compare the impact of FISP under a fixed exchange rate policy to that under a flexible exchange rate policy. As far as GDP at market prices is concerned (see Table 4.5) the outcome is similar. However, exports perform better and imports are somewhat curtailed under the flexible exchange rate policy, causing GDP expansion to be marginally higher than under the fixed exchange rate policy (i.e., 1.1 percent compared to one percent). Therefore, while the fixed exchange rate helps curtail costs of the program, this comes at the expense of the rest of the economy. The effect, however, is clearly not large, basically because the movement in the exchange rate (0.6 percent depreciation) or parallel market exchange rate (two percent premium) is relatively small. This reflects the fact that fertilizer imports is a relatively small component of total imports, even when FISP is introduced. Initially, prior to FISP, fertilizer imports account for about 8.1 percent of total imports. After the program's introduction subsidized fertilizer imports accounts for 7.2 percent of total imports, but non-subsidized fertilizer imports drop to 4.6 percent due to a displacement effect. Total fertilizer import therefore increases to 11.7 percent under FISP, which in value terms implies a 50 percent increase in fertilizer imports, but in relative terms is only 4.5 percent of the value of imports. In reality, therefore, the impact of FISP itself on the balance of payments is rather insignificant. Table 4.6 confirms that, even at sector-level, the FISP impacts are very similar under fixed and flexible exchange rate regimes, with the exception perhaps of a weaker export sector performance under the fixed exchange rate regime.

Table 4.5. GDP at market price: risk and policy environment scenarios

	Benchmark FISP scenarios (joint-funded, indirect taxes)		Risk factors and exchange rate policy environment							
			Fertilizer and fuel price shocks				Tobacco price shocks			
			No FISP		With FISP		No FISP		With FISP	
			Flexible exchange rate	Fixed exchange rate	Flexible exchange rate	Fixed exchange rate	Flexible exchange rate	Fixed exchange rate	Flexible exchange rate	Fixed exchange rate
Domestic absorption	1.4	1.4	-6.5	-7.0	-7.2	-7.5	-2.2	-3.9	-0.8	-2.7
Exports	3.5	2.5	20.5	11.0	27.2	17.3	-2.6	-27.2	1.9	-23.2
Imports	3.8	3.1	-6.1	-12.8	-5.0	-11.8	-5.1	-19.7	-0.8	-16.0
GDP at market prices	1.1	1.0	0.3	-0.1	0.8	0.5	-1.1	-3.8	-0.1	-2.8
<i>Exchange rate appreciation (-) or depreciation (+) (%)</i>	0.6	-	6.4	-	6.9	-	14.1	-	14.1	-
<i>Exchange rate premium (%) in parallel market</i>	-	2.0	-	24.5	-	27.7	-	84.2	-	88.8

Source: CGE model results

Table 4.6. GDP at factor cost, by sector: risk and policy environment scenarios

	Benchmark FISP scenarios (joint-funded, indirect taxes)		Risk factors and exchange rate policy environment							
			Fertilizer and fuel price shocks				Tobacco price shocks			
			No FISP		With FISP		No FISP		With FISP	
			Flexible exchange rate	Fixed exchange rate	Flexible exchange rate	Fixed exchange rate	Flexible exchange rate	Fixed exchange rate	Flexible exchange rate	Fixed exchange rate
Total GDP	4.1	4.1	0.8	0.7	4.4	4.5	-0.8	-1.9	3.4	2.3
<u>Agriculture</u>	<u>13.9</u>	<u>13.9</u>	<u>1.9</u>	<u>1.8</u>	<u>15.2</u>	<u>15.4</u>	<u>-1.7</u>	<u>-3.4</u>	<u>12.1</u>	<u>10.3</u>
Cereals	31.7	31.9	-22.4	-18.8	3.9	6.4	8.5	10.9	41.8	43.4
<i>Maize</i>	<i>36.1</i>	<i>36.3</i>	<i>-26.4</i>	<i>-22.7</i>	<i>4.0</i>	<i>6.1</i>	<i>9.8</i>	<i>10.6</i>	<i>47.9</i>	<i>47.5</i>
Export-oriented crops	7.0	6.1	44.2	33.7	58.9	49.6	-24.7	-50.1	-19.6	-46.8
<u>Industry</u>	<u>-0.9</u>	<u>-0.9</u>	<u>-1.3</u>	<u>-2.0</u>	<u>-3.1</u>	<u>-4.0</u>	<u>-0.2</u>	<u>-3.9</u>	<u>-0.9</u>	<u>-4.6</u>
<u>Services</u>	<u>-0.6</u>	<u>-0.6</u>	<u>0.8</u>	<u>0.8</u>	<u>0.0</u>	<u>0.2</u>	<u>-0.4</u>	<u>-0.3</u>	<u>-0.9</u>	<u>-0.6</u>

Source: CGE model results

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We examine the external shocks first in the absence of FISP and then consider the shock together with FISP (see Table 4.6 and Table 4.7). Under an assumption of a highly flexible economy that has the ability to facilitate large structural changes and a reallocation of resources across sectors, we find that the increase in fertilizer prices (without FISP) only has a minimal effect on overall GDP. Domestic absorption, however, declines sharply, which relates to the reduced capacity to import goods, either as a result of the appreciating exchange rate or the rising premium on foreign exchange in the fixed exchange rate closure. Export sectors, on the other hand, expand rapidly, even under the fixed exchange rate scenario, thus offsetting much of the loss in the cereals sector resulting from increased fertilizer costs. This result is perhaps overoptimistic as reality suggests that the agricultural sector cannot and does not respond as rapidly and easily to market signals. The introduction of FISP negates the losses in the cereals sector as fertilizer prices, from the farmer's perspective, now actually declines in real terms. FISP also frees up land, which means even more land can be reallocated to export sectors (e.g., to benefit from the weaker exchange rate in the flexible exchange rate scenario).

The tobacco price shocks have a distinctly negative impact on the economy. Despite the sharp depreciation of the exchange rate under the flexible exchange rate scenario, there is a large exodus from export sectors (i.e., tobacco in particular) as farmers reallocate resources to non-tradable sectors such as cereals. Under the fixed exchange rate scenario the decline in GDP in the export sectors is even more pronounced as there is no exchange rate depreciation to cushion the effect of declining tobacco prices. With a premium of 84.2 percent on foreign exchange, imports become extremely expensive, leading to a large decline in imports. FISP further amplifies the reallocation effect by boosting non-tradable maize production further. Under a flexible exchange rate regime, however, the program becomes very costly. These costs can be contained with a fixed exchange rate policy, but this comes at an even greater expense of export sectors which lose almost half their GDP value. In general, welfare levels are preserved much more effectively under a flexible exchange rate regime when the economy faces rapidly declining maize prices.

Table 4.7 summarizes some of the key poverty outcomes. While FISP reduces poverty, the effectiveness in doing so is enhanced under a flexible exchange rate policy which permits export sectors to benefit from increased land availability and a more competitive exchange rate level. The external shocks modeled generally cause poverty to increase (we do not show the results without FISP). FISP alleviates the situation for the poor somewhat, but the policy is more effective in doing so when implemented with a flexible exchange rate environment.

Table 4.7. Poverty outcomes: risk and policy environment scenarios

	Benchmark FISP scenarios (joint-funded, indirect taxes)			FISP and external shocks			
	Initial poverty rate	Flexible exchange rate	Fixed exchange rate	Fertilizer and fuel price shocks		Tobacco price shocks	
				Flexible exchange rate	Fixed exchange rate	Flexible exchange rate	Fixed exchange rate
Poverty headcount (P_0)							
National	52.4	-1.4	-1.1	0.6	3.4	-0.2	7.5
Rural	55.9	-1.4	-1.1	0.1	3.4	-0.4	8.4
Urban	25.4	-1.2	-1.2	4.4	3.3	1.2	0.3
Depth of poverty (P_1)							
National	17.8	-0.7	-0.5	0.4	2.4	-0.2	6.5
Rural	19.2	-0.7	-0.6	0.3	2.5	-0.2	7.1
Urban	7.1	-0.4	-0.4	1.2	1.5	0.4	1.7

Source: CGE model results

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Comparison with social cash transfers

In this final section we compare the GDP and poverty outcomes under FISP with those of universal and targeted cash transfer programs with a similar budget. As noted previously, cash transfer and input subsidy programs differ fundamentally in terms of their design and implementation. While both aim to address liquidity constraints faced by the poor, cash transfers provide more freedom to recipients in terms of the spending choices they have. However, cash transfers do not necessarily only have consumption effects; recipients may choose to use cash transfer income to invest in productive activities (e.g., crop production), thereby having a very similar outcome to an input subsidy. A shortcoming from our model is that it does not include behavioral response at the household level; hence, the cash transfer does not have a direct production effects, but only an indirect one (i.e., via the consumption channel).

Table 4.8 summarizes the results. We use the jointly-funded FISP with progressive taxation as benchmark here since our cash transfers are also funded via income taxes. Two types of cash transfer programs, namely a universal program (or non-targeted) and a targeted program, are considered. The latter targets the poorest 60 percent of households. In both programs we assume that each beneficiary receives the same transfer amount and that the overall program cost is the same as the FISP benchmark scenario. As in the FISP scenario, around one-quarter of the cash transfer program is funded by donors.

Table 4.8 GDP and poverty: FISP versus social cash transfers

	FISP	Universal cash grant	Targeted cash grant
Domestic absorption	1.4	0.5	0.4
Exports	3.5	-2.8	-3.1
Imports	3.8	0.1	-0.1
GDP at market prices	1.1	-0.2	-0.3
<i>Exchange rate appreciation (-) or depreciation (+) (%)</i>	1.83	-0.46	-0.27
Poverty headcount (P_0)			
<u>National</u>	<u>-1.1</u>	<u>-3.1</u>	<u>-5.5</u>
Rural	-1.1	-3.2	-5.7
Urban	-1.2	-2.4	-4.2
Depth of poverty (P_1)			
<u>National</u>	<u>-0.5</u>	<u>-2.2</u>	<u>-3.7</u>
Rural	-0.6	-2.3	-3.8
Urban	-0.4	-1.3	-2.3

Note: (*) The government share is funded through direct taxes in those simulations.

Whereas FISP causes both GDP and domestic absorption to rise, only domestic absorption rises in the cash transfer scenarios while GDP declines. On contrast to FISP, the cash transfer program is not directly linked to importation of goods; hence, when donor funding enters the economy to finance the new cash transfer program, the exchange rate appreciates. This causes exports to decline, which is the main explanatory factor for the decline in GDP. Since FISP directly promotes domestic production activities and raises value-added in the economy, it has a large domestic multiplier effect compared to cash transfers. For this reason FISP could be regarded as more sustainable than a cash transfer program that promotes domestic production indirectly via the consumption channel. Depending on marginal spending propensities, at least part of additional income earned by households from cash transfer schemes is “leaked” from the economy in the form of imports. Targeting the poorest ensures that the additional spending has a higher domestic content, while universal targeting implies inclusion of households whose consumption bundles have a higher import content. Finally, cash transfers—in particular targeted transfers associated with a larger per capita cash value—are clearly more effective at reducing poverty

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than an input subsidy program. Increased poverty reduction, however, comes at the expense of reduced economic activity.

Cash transfers and input subsidy programs impact on different dimensions of household-level food security. For targeted households, FISP increases maize supply from home production, affords a more stable diet, and possibly a higher quality one through crop diversification and increased spending power. Non-targeted households benefit from increased availability of food at lower prices and higher wages. The extent of these effects depends partly on program scale, but also on the efficiency with which subsidized inputs are utilized. Since the poorest producers are often less efficient, the poorest are only targeted for equity reasons. Cash transfers also improve beneficiaries' access to food and their dietary quality, to the extent that food is available locally. Cash transfers could possibly be put to productive use, which would increase access to self-produced food or increase income indirectly via sales of output. For non-targeted households, cash transfers only have an indirect impact through spending by beneficiary households.

Ideally, therefore, cash transfers and input subsidy programs should not be seen as substitutes and should not compete for the same funds. The HLPE (2012) report on social protection for food security promotes a twin-track strategy in terms of which essential assistance is provided in the short-term and livelihoods are supported in the long term. When applying this recommendation to the case of Malawi, it could translate into the adoption of *both* cash transfers and input subsidies: for example, cash-constrained poor farmers with the potential to increase staple food production and productivity would receive both, with the cash transfer helping them to redeem the coupons from the subsidy program; the poorest labour constrained households with little or no land receive only cash transfers; and those productive smallholders that are less cash constrained receive only the input subsidy.

5. CONCLUSIONS

While the Government of Malawi prepares the ninth consecutive year of implementation of its program of input subsidy, this paper reviews existing literature and complements existing evaluations by estimating the general equilibrium effects of this agricultural policy on the economy of Malawi. We specifically evaluate the impacts of fertilizer and agricultural price variations, assess the program's fiscal sustainability, and compare it against alternative socioeconomic policies. In highlighting the lack of clarity on the objectives of the subsidy program, we further discuss alternatives to reach the most vulnerable households and increase household-level food security. Particular attention is given to social cash transfers, currently being deployed on a large scale in the country.

Thanks to an updated SAM representing Malawi before the input subsidy program, this study is able to consider the policy within a general equilibrium context. The analysis includes direct and indirect effects in the economy, including on labor markets and prices, which are not typically captured in partial equilibrium or micro-econometric studies. It is all the more important to take them into account that previous studies point to the fact that the ability of fertilizer subsidy programs to lower maize prices and increase agricultural wage rates could have a more pronounced effect on the welfare of the poor than does receiving the subsidy directly. Assuming an intensification of maize production system as a consequence of the FISP, we find that an input subsidy of MK7,500 million (2003 prices) increases maize production by 14 percent, increases yields by more than 30 percent, and increases diversification of crop produced through the reallocation of roughly 200,000ha of land to other crops. Value added in the maize sector increases significantly more than output due to increased factor returns. National poverty only decreases marginally. As a consequence of the decrease in domestic maize price, poverty decrease concerns both net producing households and net consuming households.

The study also considers issues around financing, implications for taxation and spending, and the overall financial sustainability of the program. A major issue in Malawi, especially with a history of exchange rate rationing until recently, is the effect that FISP has had on the balance of payments in the past, and the effect that it may have on a flexible exchange rate in the future. Since the bulk of the cost of FISP is allocated to imported fertilizer, yet the program boosts production of what is essentially a non-tradable good from which little or no foreign exchange can be earned, the program will always contribute to the balance of payment deficit. While we find that FISP itself does not have a major impact on the balance of payments, the sustainability of the program is at risk when combined with external shocks such as a sharp rise in fertilizer prices or the collapse in tobacco prices. Ultimately, the program's resilience will be enhanced by a flexible exchange rate regime, although government will no longer be able to control program costs in the same way as before under a fixed exchange rate regime.

Policy evaluations are most useful when policies are compared to alternatives with similar objectives and costs. Based on the targeting criteria, we consider that the primary objective of the program is to increase household level food security, in much the same way as the social cash transfer program currently being scaled up in Malawi. Impacts of both programs of similar size and identical funding mechanism are compared. FISP directly promotes domestic production activities and raises value-added in the economy, while cash transfers lead have a lower domestic absorption effect and only promote domestic production indirectly via the consumption channel. Cash transfers are, however, more effective at reducing poverty. Ideally, therefore, cash transfers and input subsidy programs should not be seen as substitutes for one another but rather as complements. For example, cash-constrained poor farmers with the potential to increase staple food production and productivity could receive both subsidies and cash transfers, with the cash transfer helping them to redeem the coupons from the subsidy program; the poorest labour constrained households with little or no land receive only cash transfers; and those productive smallholders that are less cash constrained receive only the input subsidy.

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