Social Protection and Food Security in Sub-Saharan Africa: An Evaluation of Cash Transfer Programmes

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Social Protection and Undernourishment: An Evaluation of Cash Transfer Programmes in Sub-Saharan Africa

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Abstract

This paper evaluates the effects of cash transfer (CT) programmes introduced during the 1990s and 2000s on undernourishment in a sample of African countries. We apply the synthetic control method to compare changes in the post-intervention undernourishment trajectories of economies affected by CT programmes relative to their unaffected counterparts. The results suggest that CT programmes exert significant effects on the prevalence of undernourishment in low-income and fragile sub-Saharan countries, whereas lesser important and more articulated it is the impact on the dietary energy supply adequacy. Robustness analysis via placebo experiments confirms the soundness of our results, and their implications for policymakers are discussed.

Keywords: Sub-Saharan Africa, Undernourishment, Cash Transfers.
JEL Classification: Q1, Q18, O13

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1. Introduction

Recently, threats of financial collapse and global recession, food shortages, and rising food prices have exacerbated nutrition vulnerability to adverse shocks[1]. One consequence has been the increased presence of food insecurity even in countries unaffected by recurrent famine (Gentilini, 2007; Crawford et al., 2010). A number of inquiries showed that the relationship between food intake and nutritional achievement could vary greatly depending, amongst other things, on the level of access to complementary inputs: healthcare, basic education, clean drinking water, sanitation and so on (Dreze and Sen, 1989). These analyses supported a pragmatic approach to promoting capabilities and incentives, one that tackled hunger and food insecurity by bridging food assistance and other pillars of social protection (Crawford et al., 2010). In accordance with this perspective, new social protection measures have been implemented in numerous underdeveloped and emerging countries (Gentilini and Omamo, 2011).

Social protection programmes targeting poor, or those who may become poor as a result of adverse shocks, can take many forms: cash transfer (CT) schemes involving welfare payments, child allowances or pensions; in-kind transfers such as food aid or school food programmes; subsidies for goods purchased by the poor; unemployment insurance, and public works or workfare schemes. The 'new social protection agenda' includes interventions that link the recipients of cash or food payments to other government services and conditional cash transfer (CCT) schemes (Hoddinott, 2012). These programmes provide cash payments to poor households that meet certain behavioural requirements, generally related to children's healthcare, child nutrition and education, with the aim of promoting longer-term human capital investments (Fiszbein et al., 2009).

Despite the abundance of social protection innovations and studies assessing their effectiveness, the literature still lacks inquiries that rigorously measure the effects of such innovations in sub-Saharan Africa (Gilligan et al., 2009)[2]. This paper partially fills this gap by evaluating the effects of specific social protection programmes (i.e. CTs) introduced in the past 20 years on undernourishment. These programmes, which constitute the dominant form of social transfer in this

[1] Following the food and economic crises, in 2009 more than a billion people worldwide were undernourished (FAO, 2011). The UN Food and Agriculture Organization (FAO) estimates that in 2010-12 period, about 870 million people were undernourished (FAO, 2012).

[2] An exception is Ethiopia's Productive Safety Nets Programme (PSNP), the largest social protection programme in sub-Saharan Africa. The PSNP has been rigorously evaluated across a range of indicators by Gilligan et al. (2009) and Sabates-Wheeler and Devereux (2011), amongst others.

region, can be provided as alternatives or complements to vouchers or traditional food transfer programmes[3]. They deal with short-term poverty by providing guaranteed extra money and serve as insurance against the risk of food insecurity.

This paper contributes to the current literature determining whether CT has positive shifts in alleviating undernourishment, an interesting exercise because of the nature of our sample countries. The extreme poverty and pervasiveness of hunger in sub-Saharan Africa opens to question certain facts that are taken for granted in other parts of the world, particularly the responses to welfare transfers in terms of individual or household behaviour. We use the synthetic control method (Abadie et al., 2010) to evaluate policy interventions on the prevalence of undernourishment indicator and dietary energy supply index. As our data were collected primarily for evaluation of CTs' effects on chronic undernourishment, we were able to estimate the extent to which the trajectory defined by the synthetic control estimator predicts changes in the proportion of undernourished people, as implied by the quasi-experimental setting. Because the latter can be estimated with some degree of confidence given the existence of similar countries that are not subject to CTs, we can use these results to measure the effects of the policy intervention. Note that identification of the specific country features we estimate in predicting how undernourishment status changes with policy implementation, may or may not confirm the channel through which the intervention operates. For example, CTs may affect the prevalence of undernourishment without significantly modify the adequacy of the dietary energy supply, which indicates an improvement only on the distribution of food.

Our results suggest that the selected ten African countries subjected to CT programmes have differing effects on the outcomes and, in seven cases, reduce undernourishment significantly through the improvement in the distribution of the existing food availability. Conversely, we do find a significant impact of CTs on average dietary energy supply adequacy only in Rwanda, Sierra Leone and Mali. We explain this significant difference in the motivation and strategy of the CTs application. In most of the cases considered here, CTs are part of a large-scale humanitarian response to a food emergency and have immediate effects on food distribution. However, in Rwanda and Sierra Leone the CTs intervention is more articulated and represents the start up of a post-conflict development strategy, which determines an improvement on the average of energy supply

[3]For a discussion of alternative food assistance policy tools, see Gentilini and Omamo (2011).

apart from the prevalence of undernourishment. The increase on the availability of food is also significant in Mali, which appears the extensions of the positive results of the CT pilot project addressed to women and children and implemented in this country in the year 2000 (Holmes and Barrientos, 2009).

The remainder of the paper is organised as follows. In Section 2, we present the data. In Section 3, we discuss methodological issues whereas in Section 4 we provide the results of our empirical analysis, discuss the main results and draw the relevant policy implications. Section 5 concludes the paper by summarising the key issues.

2. Data

In this section, we present the main variables of interest for our analysis. Our empirical analysis is based on a dataset covering 48 sub-Saharan African countries for the 1992-2010 period. In particular, the length of the sample period is strongly influenced by data availability.

We attempt to investigate undernourishment through two complementary outcomes which characterize the multidimensional content of food insecurity. The first is the prevalence of undernourishment (PU), which is based on the proportion of the population subject to chronic undernourishment[4]. This measure indicates the population estimated to be at risk of calorie inadequacy. It proxies the availability and access dimensions of food security at the country level, and is extracted from the Food Security Indicators redacted yearly by the Food and Agricultural Organization (FAO).

Despite the wide adoption of this indicator in food security analyses, a number of questions arise in its use. Dasgupta (1993) and Svedberg (2002) discuss this indicator critically and argue that reliance on it may result in a significant underestimation of global undernutrition[5]. Such an argument is also advanced by Masset (2011) whose criticism relies on the lack of robustness of the parameters used in the indicator's calculation; in particular, energy cut-off points, food availability and the distribution of calories across households.

[4]See Masset (2011) for a review of hunger indices and methodological issues.

[5]With regard to content, the indicator's reliance on the distribution of the country's average annual per capita food consumption means that short-term phenomena such as seasonal crises are not covered. Further, the indicator is not intended to capture the evolution in the fundamental elements that drive the long-term nutrition condition in a country. In addition, chronic hunger is not the only interesting phenomenon that needs to be monitored. The evolution in food production, prevailing dietary composition and ratio of food expenditure to other basic needs expenditures such as health services and education may be equally important in monitoring the state of food security and the role that agricultural and food policies play therein (Cavatorta and Pieroni, 2013).

In contrast, the FAO indicator of chronic hunger has the undeniable merit of having raised and kept high awareness of the broader malnutrition problem. As Cafiero and Gennari (2011) suggest, if the aim is to assess the country-level changes in chronic hunger affected by one specific policy (e.g. CT), the limited reliability of the FAO's PU indicator is not likely to influence significantly its patterns because it can be detached during estimation by including country fixed effects or specific control variables that are linked with its multidimensional framework.

The second outcome that we use in our analysis is the average dietary energy supply adequacy ($ADESA$) which expresses the Dietary Energy Supply (DES) as a percentage of the Average Dietary Energy Requirement ($ADER$) in the country. Each country's or region's average supply of calories for food consumption is normalized by the average dietary energy requirement estimated for its population, to provide an index of adequacy of the food supply in terms of calories. Clearly, the goodness of this indicator is associated with the reliability of the underlying official data on production, trade and the extent of various non-food uses. In particular, the literature concentrates the debate on the role of inventories changes which affects the precision of the DES indicator in any single year (Cafiero, 2011). For this reason DES is estimated as an average over 3 years.

Analyzed together with the PU, it allows discerning whether undernourishment is mainly due to insufficiency of food supply or to particularly bad distribution. Thus, from an interpretative point of view, countries with low average dietary energy supply adequacy may need of introducing policies for enhancing the means of making more food available to their citizens, including production enhancement, increased trade and effective stock management. On the contrary, in countries where there are high levels of both average dietary energy supply adequacy and undernourishment, a focus on enhancing food supply and distribution may be required.

From the same data source, we extract four additional variables, which we use as covariates in the evaluation procedure: the access to improved water sources (AW), access to improved sanitation facilities (AS), the cereal import dependency ratio (CID), and the political stability and absence of violence/terrorism index (PSV). Whilst AW and AS reduce the risks of diarrhoea and other diseases that hamper the capacity to convert food into good nutritional outcomes, the CID and PSV have direct effects on a country's probability of experiencing undernourishment (Dreze and Sen, 1989; Smith, 2000; Masset, 2011; UNDP, 2012). In more detail, AW is measured as the percentage of the population with reasonable access to an adequate amount of water from an

improved source, such as a household connection, public standpipe, borehole or protected well or spring or rainwater collection. Reasonable access is defined as the availability of at least 20 litres per person per day from a source within one kilometre of the individual's dwelling. AS refers to the percentage of the population with at least adequate access to excreta disposal facilities that can effectively prevent human, animal and insect contact with excreta. Improved facilities range from simple, but protected, pit latrines to flush toilets with a sewerage connection. To be effective, these facilities must be correctly constructed and properly maintained.

CID is the sum of imports and production minus exports by region and sub-region. When the international prices of primary commodities start to rise, highly import-dependent countries are likely to suffer, with a consequent increase in undernourishment. This variable can account for wheather-related characteristics which are relevant cyclical determinants of food supply.

Finally, the PSV index represents the underlying institutional determinants of food availability. This index measures perceptions of the likelihood that the government will be destabilised or overthrown by unconstitutional or violent means, including politically motivated violence and terrorism. We use an indicator produced by the Brookings Institution and World Bank Development Research Group, which reflects the statistical compilation of survey responses given by a large number of enterprises, citizens and experts in industrial and developing countries, as reported by several survey institutes, think tanks and non-governmental and international organisations. The PSV index varies from approximately -2.5 (weak stability) to 2.5 (strong stability), with an improvement in governance indicating increased food security.

In addition, data on two variables are collected from the World Bank's African Development Indicators. Our variables of interest are the percentage of female pupils at the primary level, including enrolments in public and private schools, and the annual growth rate of per-capita GDP. A discussion of the importance of per-capita GDP for summarising a country's economic condition is omitted to save space. The positive relationship between female education and food security is well documented in the development literature (Behrman and Wolfe, 1987; Kassouf and Senauer, 1996; Burchi and De Muro, 2012). Educated women ensure good nutritional outcomes for their families through their capability to make use of information on good health and nutritional practices.

3. Methods: synthetic control approach

In evaluating the effects of CTs on undernourishment, it is necessary to compare countries that have and have not experienced these transfers. The challenge is to find countries that are sufficiently similar in the sub-Saharan Africa to ensure that any differences in undernourishment outcomes reflect the policy intervention rather than disparities in country characteristics. We follow Abadie and Gardeazabal (2003) and Abadie et al. (2010, 2012) who propose a method based on the synthetic control approach. In this framework, a weighted combination of potential control countries (the synthetic control) is constructed to approximate the most relevant characteristics linked with the undernourishment indicators of the treated countries. Schematically, when a CT is introduced, the synthetic control method is used to estimate changes in the patterns of PU and $ADESA$ by comparing the observable outcome trends with those estimated in countries undergoing no policy intervention.

More formally, given a sample of sub-Saharan African countries indexed by J, we can distinguish between a set of J_1 countries that have introduced a CT policy (treated countries) and a set of J_0 countries that are potential controls for comparison, such that that $J = J_0 + J_1$. Following Abadie et al. (2012), we define the potential comparison controls as "donor pool"[6] and suppose that the characteristics of each treated unit may be better approximated by a weighted average of countries in the donor pool. It is also assumed that the sample is a balanced panel for the time span $t = 1, ..., T$ and includes a number of pre-intervention periods T_0 and post-intervention periods T_1, such that $T = T_0 + T_1$. The synthetic control can then be represented by a vector $(J_0 \times 1)$ of weights $W = w_1, ..., w_{J_0}$, with $0 \leq w_{J_0} \leq 1$ and $w_1 + ... + w_{J_0} = 1$, where W is chosen to better reassemble the characteristics of the treated units in the synthetic control (Abadie and Gardeazabal, 2003).

We define X_{j_1} as a $(k \times 1)$ vector containing the pre-intervention characteristics of one treated unit j_1 in the set of treated unites J_1, and X_{J_0} as a $(k \times J_0)$ matrix of the pre-intervention characteristics of the donor pool. Our intent is to find a set of W^* that minimises the distance $\sum_{m=1}^{k} v_m \left(X_{j_1 m} - X_{J_0 m} W\right)^2$, where $m = 1, ..., k$ and v_m is a weight that reflects the relative importance assigned to the $m - th$ variable when we measure the discrepancy between X_{j_1} and $X_{J_0} W$. Introducing synthetic control weights v_m, we can describe the relevance of the explanatory variable

[6] The donor pool is defined as a reservoir of potential comparison units.

chosen to measure the synthetic control. Indeed, as Abadie et al. (2012) show, we can infer the goodness of the chosen variables by comparing the synthetic control values of each k variable with their simple mean in the donor pool.

We now focus on Y_1, one vector $(T_1 \times 1)$ of the outcome of unit j_1 in set J_1 in post-intervention period T_1, that is, $Y_1 = (Y_{j_1 T_0+1}, ..., Y_{j_1 T})'$. Symmetrically, we define Y_0 as a matrix $(T_1 \times J_0)$ containing all of the post-intervention characteristics of the countries in the donor pool. The synthetic control estimator for the countries that experienced CTs in the given period is expressed as the difference between $Y_1 - Y_0 W^*$. Hence, for a given post-intervention period $t > T_0$, the synthetic control estimator for a treated unit j is $Y_{j_1 t} - \sum_{J_0} w^* Y_{J_o t}$. Matching variables X_{j_1} and X_{J_0} are supposed to be the predictors of post-intervention outcomes, which are themselves unaffected by the intervention. Abadie et al. (2010) propose a linear factor model to estimate $Y_1 - Y_0 W^*$, that reduces both the number of unmeasured factors affecting the outcome variables and the heterogeneity in the effects of observed and unobserved factors.

Controlling for unobservable factors ideally requires a large pre-intervention time span T_0. However, when undernourishment indicators are used as the outcome variables, trade-offs may arise between the length of the time span and their performance. As clarified in the previous section, the temporal behaviour of food insecurity is highly volatile and depends on a series of shocks. For example, epidemics, natural disasters or distractions arising from armed conflicts, which can permanently modify the behaviour of the time series, net of the smoothing determined by the average over three years in constructing undernourishment indicators. As another necessary condition to evaluate the effects of CT policies, we need to find a period of time in which no other policies have been implemented specifically to affect significantly undernourishment. As a consequence, an *ad hoc* sufficiently long time span is proposed for each treated country.

To confirm the goodness of our estimated results, we perform a placebo test for each CT intervention on the two undernourishment indicators. We replicate the synthetic control estimate of each treated unit for each country in the donor pool. In other words, for a given country in subset J_0 that does not implement a CT policy at time $t > T_0$, we expect an unusually large gap in relation to the respective treated country. If we do obtain this result, our interpretation is that the analysis provides significant evidence that CTs reduce PU and/or increase $ADESA$. If the placebo tests produce gaps similar to those for the treated countries, in contrast, then our

interpretation is that the analysis does not constitute evidence of a significant CT impact on these undernourishment outcomes.

3.1. Case study selection

A preliminary step in the synthetic control method is to identify feasible treated units and the donor pool. The upper part of Table 1 lists countries that introduced CT policies (treated units) in the sample period, whilst the bottom part lists the donor pool countries. The last column of Table 1 shows the sub-Saharan African countries by income class following the World Bank classification (Garcia and Moore, 2012). This classification allows us to distinguish CTs implemented in upper-middle income countries from those offered to low-income and fragile state countries.

Middle-income CTs often take the form of cash grant programmes planned for the long term. They are usually managed by government institutions and are domestically funded. These CT programmes are stable in nature and target social protection, without any specificity to food insecurity. For example, these are addressed to vulnerable groups such as the elderly.

Conversely, low-income and fragile state countries implement CTs that are often designed to combat food insecurity within a relatively short-time frame. They are typically non-government programmes that are partially or fully funded by donors. Because they are not centrally administered, the management information systems of these programmes are usually ad hoc in nature. They are generally emergency responses to natural disasters or man-made events, and they are not linked to other programmes.

For the inclusion in the set of treated units, a country had to satisfy two narrow and necessary conditions: i) its CT policy had to be implemented after 1996, with a minimum of pre-intervention periods (e.g., $T_0 = 5$); and ii) only one CT policy was implemented or that other major complementary policies were not implemented before the CT. The latter condition was adopted to allow identification of the interventions' effects. Following application of these conditions, we excluded Botswana, Cape Verde, Nigeria, Senegal, South Africa, Mozambique and Zambia from the treatment sample. The exclusion from the treated sample of Ghana and Niger was determined by correlates policies, which affected undernourishment outcomes.

For example, Ghana introduced in 2004 subsidies to compensate for higher liquid petroleum gas (LPG), petrol and kerosene prices[7]. With an expenditure totalling about 2.2% of GDP, this

[7]See, for a discussion, (Grosh et al., 2008).

Table 1: Cash transfer policies in sub-Saharan Africa

Country code	Country name	Treatment date	Income group
		Treated units	
LSO	Lesotho*	2005, (2009)	Upper-middle income
SWZ	Swaziland	2005	Upper-middle income
BFA	Burkina Faso	2008	Low income
ETH	Ethiopia	2005	Low-income
KEN	Kenya*	2005, (2009)	Low-income
MLI	Mali	2005	Low-income
MWI	Malawi	2005	Low-income
RWA	Rwanda	2006	Low-income
SLE	Sierra Leone	2005	Fragile state
ZWE	Zimbabwe	2004	Fragile state
		Donor pool countries	
AGO	Angola		Upper-middle income
CMR	Cameroon		Upper-middle income
GAB	Gabon		Upper-middle income
MUS	Mauritius		Upper-middle income
COM	Comoros		Low-income
GIN	Guinea		Low-income
MDG	Madagascar		Low-income
MRT	Mauritania		Low-income
TCD	Chad		Low-income
UGA	Uganda		Low-income
BDI	Burundi		Fragile state
CIV	Ivory Coast		Fragile state
COG	Republic of Congo		Fragile state
LBR	Liberia		Fragile state
STP	Sao Tome and Principe		Fragile state
TGO	Togo		Fragile state
		Countries excluded: not in line with treatment requirements	
BWA	Botswana	1996, 2002	Upper-middle income
CPV	Cape Verde	1992, 1995	Upper-middle income
NAM	Namibia	2000	Upper-middle income
NGA	Nigeria	2008, 2009	Upper-middle income
SEN	Senegal	2009, 2010	Upper-middle income
ZAF	South Africa	1990	Upper-middle income
GHA	Ghana	2008	Low-income
MOZ	Mozambique	1993	Low-income
NER	Niger	2008	Low-income
TZA	Tanzania	2010	Low-income
ZMB	Zambia	2004,2006, 2007,2008	Low-income
ZAR	Dem. Rep. of Congo	2004	Fragile state
ERI	Eritrea	2009	Fragile state
		Countries excluded: not in line with donor pool requirements	
GNQ	Equatorial Guinea		Upper-middle income
SYC	Seychelles		Upper-middle income
BEN	Benin		Low-income
DJI	Djibouti		Low-income
GMB	Gambia		Low-income
GNB	Guinea-Bissau		Low-income
SDN	Sudan		Fragile state
SOM	Somalia		Fragile state
CAF	Central African Republic		Fragile state

Notes: The income classification of the 48 sub-Saharan African countries presented in the third column, follows the World Bank classification (Garcia and Moore, 2012). The asterisk for Lesotho and Kenya describe the post-intervention constraint due to the introduction of new policies which affected food security (2009 in parenthesis).

intervention influencing income and food security determined a distortion of the causal estimation of the subsequent CT in 2008. Similarly we cannot identify the effects of the implementation of the CT in Niger (in 2008). Since 2005 the government has made cut-price cereals available to those who need help in recovering from shortages in the previous years, it is likely that the effects on undernourishment outcomes of this significant policy intervention are at least time-correlated with the CT intervention. In addition, Tanzania and Eritrea were excluded because there was an insufficient post-intervention time period for these two countries. The Democratic Republic of Congo and Namibia were excluded because of missing data. The final treatment sample comprises 10 countries.

Note that in the majority of the upper-middle income countries more than one CT policy was implemented, thus violating condition ii). This condition restricts our analysis to Lesotho and Swaziland, meaning that we could examine CTs' effects on PU and ADESA only at the country level for this income group.

The donor pool was also chosen to satisfy two main requirements: i) the countries therein had not experienced a CT policy, or ii) any other policy with indirect effects on undernourishment. Twenty countries met both requirements and thus formed the donor pool after excluding 16 countries that did not meet the first requirement in the 1990-2010 period and we excluded 5 countries (Benin, Central African Republic, Djibouti, Gambia and Guinea-Bissau) that did not meet the second.

The interventions that had important food security implications for these five excluded countries were: i) the Emergency Food Security Support Project (EFSSP) implemented in 2008 by the government of Benin and the World Bank (World Bank, 2008b) to assist the population experiencing food insecurity following a food price crisis; ii) a poverty reduction strategy launched in Djibouti in 2004 by the National Food Security Council (World Bank, 2012); iii) a well-structured programme designed to increase household and national food security through improved agricultural productivity, production and producers income introduced by the government of Gambia in 2004 (Republic of Gambia, 2005); iv) the EFSSP promoted by the World Bank in Guinea-Bissau in 2008 to rescue the food-insecure population following a food price crisis; and v) several programmes to combat food insecurity launched by international agencies in the Central African Republic, where about 45% of the population was living in conditions of food insecurity following

the end of the country's civil war in 2005 (World Bank, 2008a; Global Food Security, 2009).

4. Empirical results

4.1. Estimates

The synthetic estimator is constructed for each country as the convex combination of characteristics in the donor pool that most resembled the matching treated country in terms of the undernourishment predictors.

Table 2 and 3 display the statistical results of a comparison between the pre-treatment characteristics of the actual treated countries and those of the synthetic control estimators. The results highlight the affinity between a country exposed to the CT programme and its synthetic counterpart, safeguarding similarly to matching estimator against estimation of extreme counterfactuals (King and Zeng, 2006)[8].

The effect of the CT policies is constructed by choosing the weight w^*, which minimises the mean squared prediction error ($RMSPE$) of each outcome in the treated country during the pre-CT period[9]. The last lines in Tables 2 and 3 confirm that the degree of $RMSPE$ is not enough large, suggesting that the data are able to perform consistently the pre-intervention period. Table 4 and 5 display the weights of each control country across the synthetic estimates. These weights indicate in the first table that the PU trend in Lesotho prior to CT programme implementation is best represented by the combination of Gabon (0.657), Republic of Congo (0.107) and six other countries for its complement (0.235), whilst the other countries in the donor pool have $W - weight = 0$. We extend this interpretation in creating the counterfactual samples for all of the columns in Table 3 and 4, which represent the weight of estimates in countries subjected to a CT programme.

The patterns of the Figures we present below show the PU trends in the treated countries (solid line) and synthetic control samples (dotted line) during the 1992-2010 period and nearby the results of the placebo tests. We first consider the two upper-medium income countries, Lesotho

[8]It should first be noted that the mean estimators of the countries that did not implement a CT programme during our sample period do not appear to be suitable to build a control group. In almost all of the treated countries under investigation, there is a large gap in the pre-treatment covariate means relative to the synthetic estimators. These results can be extrapolated by the sources used in the paper or requested to the authors.

[9]The RMSPE measures the lack of fit between the path of the outcome variable (PU) in each country and its synthetic counterpart. The pre-intervention RMSPE for a given country is defined as $RMSPE = \left(1/T_0 \sum_{t=1}^{T_0} \left(Y_{1t} - \sum_{J_0} w^* Y_{J_o t}\right)^2\right)^{1/2}$.

Table 2: Descriptive statistics of pre-treatment covariates (Outcome Variable: Prevalence of Undernourishment)

	Lesotho		**Swaziland**		**Burkina Faso**	
	Real	Synt. control (6 countries)	Real	Synt. control (4 countries)	Real	Synt. control (3 countries)
Access to improved water source	79.923	79.617	48.462	57.329	59.125	63.331
Access to improved sanitation facilities	24.615	32.686	50.923	31.067	11.188	20.066
Cereal import dependency ratio	65.500	75.307	54.523	71.948	9.488	22.636
Female primary education level	50.947	48.762	48.496	48.102	41.977	42.147
Political stability and absence of violence	0.028	0.009	-0.068	0.314	-0.077	-1.518
Agricultural population	13.558	13.457	12.840	13.066	16.185	15.739
Growth rate of per-capita GDP	3.109	-1.116	-0.997	-0.441	1.797	0.571
Mean of undernourishment prevalence	16.860	16.802	16.880	16.857	26.320	26.319
RMSPE	0.013		0.017		0.104	
	Ethiopia		**Kenya**		**Mali**	
	Real	Synt. control (4 countries)	Real	Synt. control (3 countries)	Real	Synt. control (4 countries)
Access to improved water source	25.308	36.647	49.923	55.358	42.153	59.817
Access to improved sanitation facilities	7.154	14.690	27.769	28.646	17.692	17.152
Cereal import dependency ratio	9.090	22.318	22.492	34.934	6.169	22.2671
Female primary education level	39.667	45.618	48.915	43.519	41.531	42.064
Political stability and absence of violence	-1.135	-1.132	-1.073	-1.598	0.291	-0.182
Agricultural population	17.758	14.906	16.936	15.815	15.928	15.511
Growth rate of per-capita GDP	1.001	-0.090	-0.221	-1.812	2.282	0.703
Mean of undernourishment prevalence	53.860	53.845	33.92	33.914	20.500	20.478
RMSPE	0.385		0.354		0.172	
	Malawi		**Rwanda**		**Sierra Leone**	
	Real	Synt. control (5 countries)	Real	Synt. control (8 countries)	Real	Synt. control (3 countries)
Access to improved water source	57.417	59.684	66.071	65.973	44.769	51.047
Access to improved sanitation facilities	43.833	43.691	44.929	29.624	11.154	15.393
Cereal import dependency ratio	14.792	58.603	24.350	31.907	43.292	26.517
Female primary education level	48.923	47.754	50.186	46.790	42.416	47.973
Political stability and absence of violence	-0.276	-0.603	-1.570	-0.949	-1.405	0.094
Agricultural population	15.982	13.950	15.679	15.344	14.846	15.327
Growth rate of per-capita GDP	-1.809	-1.797	0.429	0.432	-1.477	-1.615
Mean of undernourishment prevalence	27.250	27.232	43.680	43.668	40.360	40.365
RMSPE	0.249		0.848		0.193	
	Zimbabwe					
	Real	Synt. control (5 countries)				
Access to improved water source	79.667	71.942				
Access to improved sanitation facilities	40.500	40.474				
Cereal import dependency ratio	19.683	19.749				
Primary education: females	49.209	45.797				
Political stability and absence of violence	-1.124	-0.680				
Agricultural population	15.861	15.831				
Growth rate of per-capita GDP	-2.304	-1.297				
Mean of undernourishment prevalence	42.960	43.014				
RMSPE	0.008					

Notes: We report in parentheses the number of countries used to estimate the synthetic control. The "mean" of undernourishment prevalence is averaged for the five-year pre-intervention period. The *RMSPE* is estimated using the real and the synthetic control of undernourishment prevalence in the five-year pre-intervention period.

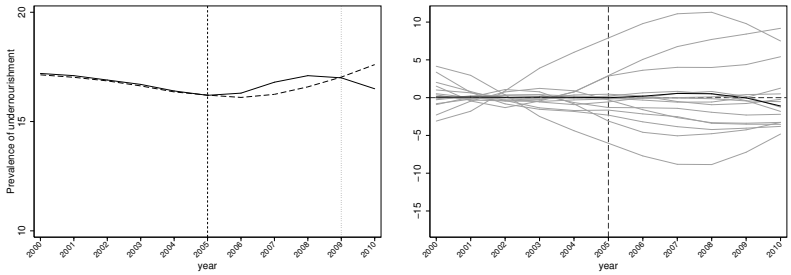
Table 3: Descriptive statistics of pre-treatment covariates (Outcome Variable: Average Dietary Energy Supply Adequacy)

	Lesotho		**Swaziland**		**Burkina Faso**	
	Real	Synt. control (4 countries)	Real	Synt. control (15 countries)	Real	Synt. control (5 countries)
Access to improved water source	79.923	70.625	48.462	51.061	59.125	62.888
Access to improved sanitation facilities	24.615	26.385	50.923	50.607	11.188	15.044
Cereal import dependency ratio	65.500	37.078	54.523	76.461	9.488	23.665
Female primary education level	50.946	48.811	48.496	47.833	41.977	41.977
Political stability and absence of violence	0.0283	0.010	-0.068	-0.089	-0.077	-1.369
Agricultural population	13.557	15.018	12.840	13.481	16.185	15.807
Growth rate of per-capita GDP	3.108	0.340	-0.997	1.881	1.797	0.785
Mean of dietary energy supply adequacy	84.341	84.346	82.481	82.323	90.543	90.466
RMSPE	0.219		0.375		0.089	
	Ethiopia		**Kenya**		**Mali**	
	Real	Synt. control (3 countries)	Real	Synt. control (3 countries)	Real	Synt. control (4 countries)
Access to improved water source	25.308	30.130	49.923	57.096	37.750	53.462
Access to improved sanitation facilities	7.154	25.721	27.769	34.680	17.000	20.861
Cereal import dependency ratio	9.090	25.489	22.492	32.870	4.575	22.939
Female primary education level	39.667	45.795	48.915	47.090	40.699	43.801
Political stability and absence of violence	-1.135	-1.240	-1.073	-1.036	0.285	-0.678
Agricultural population	17.758	15.201	16.936	14.996	15.892	15.905
Growth rate of per-capita GDP	1.001	0.806	-0.221	-2.544	2.706	2.556
Mean of dietary energy supply adequacy	66.047	66.267	73.953	73.775	80.310	80.324
RMSPE	0.824		0.681		0.030	
	Malawi		**Rwanda**		**Sierra Leone**	
	Real	Synt. control (3 countries)	Real	Synt. control (5 countries)	Real	Synt. control (3 countries)
Access to improved water source	57.417	67.386	66.071	65.062	44.769	59.251
Access to improved sanitation facilities	43.833	32.206	44.928	35.479	11.153	26.589
Cereal import dependency ratio	14.792	73.761	24.350	25.165	43.292	42.844
Female primary education level	48.923	48.091	50.186	46.463	42.415	46.760
Political stability and absence of violence	-0.276	-0.762	-1.570	-1.535	-1.405	-0.584
Agricultural population	15.982	13.838	15.678	15.726	14.846	14.767
Growth rate of per-capita GDP	-1.809	-1.515	0.429	0.304	-1.476	-1.494
Mean of dietary energy supply adequacy	81.589	81.598	71.937	72.711	73.333	73.329
RMSPE	0.326		0.396		0.101	
	Zimbabwe					
	Real	Synt. control (5 countries)				
Access to improved water source	79.66	73.039				
Access to improved sanitation facilities	40.500	32.171				
Cereal import dependency ratio	19.683	37.036				
Female primary education level	49.208	46.264				
Political stability and absence of violence	-1.124	-1.122				
Agricultural population	15.861	15.64884				
Growth rate of per-capita GDP	-2.304	-0.111				
Mean of dietary energy supply adequacy	69.147	69.108				
RMSPE	0.121					

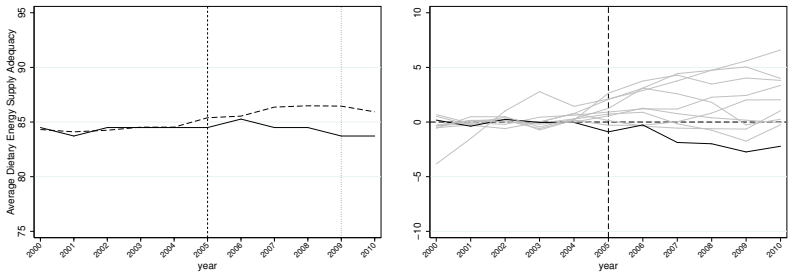
Notes: We report in parentheses the number of countries used to estimate the synthetic controls. The "mean" of dietary energy supply adequacy is the average in the five-year pre-intervention period. The *RMSPE* is estimated using the real and synthetic control of dietary energy supply adequacy in the five-year pre-intervention period.

Figure 1: Cash transfer policies and food insecurity, Upper-middle income countries

A. Lesotho

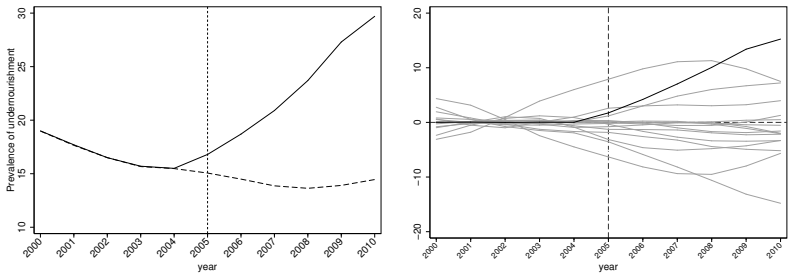


(a) estimate (b) placebo test

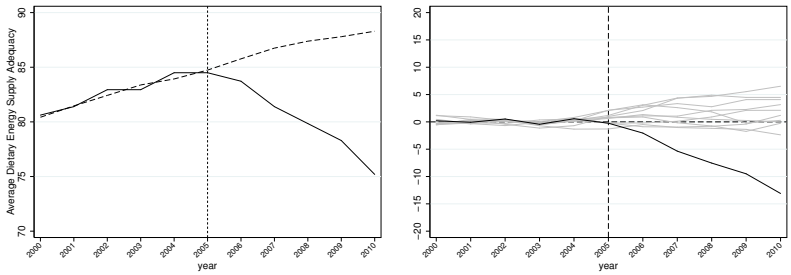


(c) estimate (d) placebo test

B. Swaziland



(e) estimate (f) placebo test



(g) estimate (h) placebo test

Notes: The solid line shows the real behaviour of the PU variable, whereas the dotted line is the synthetic control. The covariates used for the synthetic controls are reported in Table 2 and the country weights in Table 3.

Table 4: Comparison countries for each selected treatment unit (Variable: Prevalence of Undernourishment)

	Lesotho	Swaziland	Burkina Faso	Ethiopia	Kenya	Mali	Malawi	Rwanda	Sierra Leone	Zimbabwe
Angola	0.000	0.013	0.040	0.434	0.000	0.000	0.000	0.064	0.000	0.000
Burundi	0.000	0.000	0.159	0.151	0.312	0.000	0.350	0.134	0.000	0.379
Benin	0.000	0.000	0.000	0.000	0.000	0.428	0.000	0.000	0.000	0.000
Ivory Coast	0.000	0.000	0.000	0.000	0.688	0.000	0.000	0.000	0.000	0.000
Cameroon	0.000	0.000	0.000	0.000	0.000	0.176	0.015	0.001	0.000	0.385
Republic of Congo	0.107	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
Comoros	0.097	0.107	0.000	0.380	0.000	0.000	0.000	0.310	0.273	0.029
Gabon	0.658	0.000	0.000	0.000	0.000	0.000	0.514	0.000	0.000	0.000
Guinea	0.000	0.000	0.801	0.000	0.000	0.292	0.000	0.000	0.000	0.000
Liberia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
Madagascar	0.064	0.000	0.000	0.000	0.000	0.103	0.025	0.105	0.713	0.117
Mauritania	0.001	0.539	0.000	0.000	0.000	0.000	0.000	0.000	0.014	0.000
Mauritius	0.029	0.000	0.000	0.000	0.000	0.000	0.096	0.000	0.000	0.000
Sao Tome and Principe	0.001	0.340	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Togo	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Uganda	0.041	0.000	0.000	0.035	0.000	0.000	0.000	0.383	0.000	0.091

Notes: Countries and $W - Weights$ for synthetic controls constructed from the best fitting combination of countries.

Table 5: Comparison countries for each selected treatment unit (Variable: Average Dietary Energy Supply Adequacy)

	Lesotho	Swaziland	Burkina Faso	Ethiopia	Kenya	Mali	Malawi	Rwanda	Sierra Leone	Zimbabwe
Angola	0.000	0.342	0.000	0.640	0.000	0.173	0.000	0.087	0.063	0.422
Burundi	0.000	0.000	0.000	0.067	0.486	0.000	0.183	0.352	0.234	0.132
Benin	0.000	0.002	0.000	0.000	0.000	0.362	0.000	0.000	0.000	0.000
Ivory Coast	0.000	0.001	0.098	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cameroon	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.086
Republic of Congo	0.000	0.001	0.000	0.000	0.077	0.000	0.332	0.024	0.000	0.000
Comoros	0.000	0.107	0.000	0.000	0.000	0.000	0.000	0.130	0.253	0.123
Gabon	0.000	0.001	0.000	0.287	0.000	0.000	0.485	0.000	0.000	0.000
Guinea	0.000	0.002	0.836	0.000	0.250	0.000	0.000	0.000	0.000	0.000
Liberia	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Madagascar	0.456	0.055	0.042	0.227	0.000	0.037	0.000	0.000	0.214	0.230
Mauritania	0.172	0.001	0.000	0.000	0.132	0.000	0.000	0.000	0.236	0.000
Mauritius	0.125	0.350	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sao Tome and Principe	0.232	0.340	0.000	0.000	0.541	0.000	0.000	0.000	0.000	0.000
Togo	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Uganda	0.171	0.002	0.024	0.000	0.000	0.388	0.000	0.406	0.000	0.006

Notes: Countries and $W - Weights$ for synthetic controls constructed from the best fitting combination of countries.

and Swaziland, which introduced CTs in 2005 (Figure 1: panels *a* and *b*). PU in the synthetic Lesotho closely tracks the trajectory of this variable in the pre-treatment period (panel a). Along with the previous estimates of the pre-treatment covariates, the synthetic Lesotho thus provides an approximation of the PU that would have been recorded in Lesotho after 2005 in the absence of any CT. Note that the real PU trend shows no change in trajectory following policy implementation. We conclude that CTs have not improved food security in Lesotho[10]. The same pattern and statistical result is shown when we used as response outcome ADESA. Applying the same line of reasoning to the case of Swaziland, we found that immediately after CTs introduction, the country's real trend diverged from the trajectory of its synthetic control in an unexpected direction, i.e. there

[10]In the case of Lesotho, we stopped our analysis before 2009 when a second CT programme, the Child Grants Programme, was introduced.

was an increase in undernourishment. These results were also confirmed by the ADESA, with an unexpected decrease in 2005 of the average of calories after the introduction of the CT.

A different picture emerges for the low-income and fragile state countries. Panels (a) to (f) of Figure 2 show the main outcomes of analysis of the low-income group. Except for Burkina Faso, whilst PU in the synthetic Rwanda, Kenya, Ethiopia, Mali and Malawi displayed a primarily upward trend, the real PU trend in these countries underwent a sharp decline immediately after CT policy intervention. The difference between the two trajectories in subsequent years suggests a large improvement in this undernourishment outcome. Less significant is instead the estimate for the ADESA outcome. Only in Mali and Rwanda an increase on the amount of the calorie supply seems to arise significantly after the CT policy. This implies that benefits of this policy for food calorie supply acts through a better distribution of food.

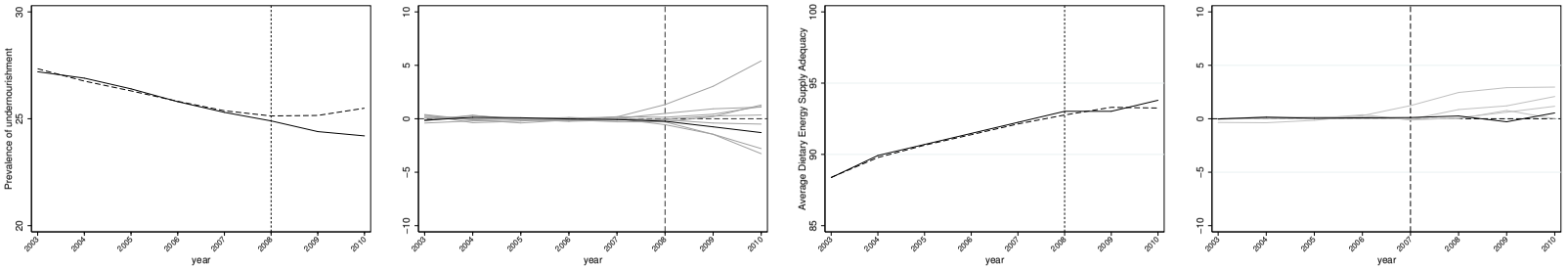
The results for the fragile state group are presented in Figure 3. The estimates show that the PU trends for the synthetic Sierra Leone and Zimbabwe continued on their moderate downward trajectories, whilst the real such trends underwent a sharper decline. In the post-intervention period, we estimated a significant reduction in the prevalence of undernourishment in these two countries. The placebo tests for Sierra Leone and Zimbabwe present a clear picture concerning interpretation of the causal effects of CTs on PU. Differently, while in Sierra Leone the food calorie supply is also significantly affected by CT, in Zimbabwe the CT policy seems to only improve the distribution of food.

Tables 6 lists the countries where CTs had significant effects on the PU estimates in terms of the variations of the outcome over time and the percentage of the population who were undernourished. Table 7 reports the CTs effects in countries where also the ADESA outcome is significant. The immediate effects of CT policies are reported in these tables along with the average effects after two and three years. Note that the estimates for years after the third should be used with caution because they may be affected by the progressive importance of time correlate confounders.

Interestingly, the magnitude of the CT effects is strongly heterogeneous in terms of the immediate effects on the PU. CTs had a large effect on undernourishment in Rwanda and Kenya, with a reduction of 3.96 and 2.18 percentage points (3-year mean value), respectively, and lower in Malawi, Mali and Zimbabwe, where the reduction was 1.86, 1.60 and 1.31 percentage points, respectively. A weaker effect of less than 1% (3-year mean value) was realised in Ethiopia and

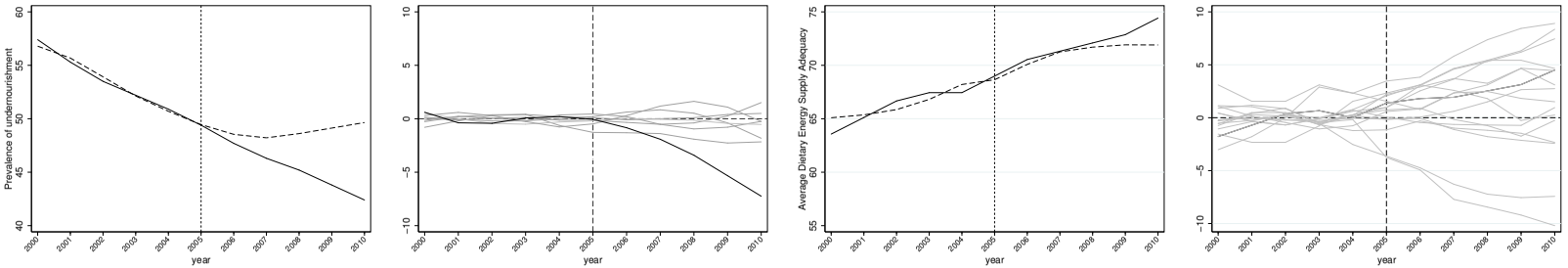
Figure 2: Cash transfer policies and food insecurity, Low-income

C. Burkina Faso



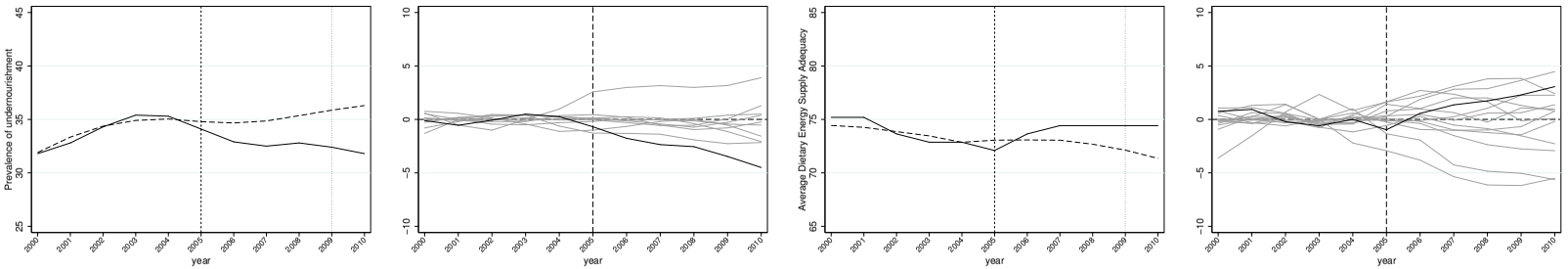
(a) estimate (b) placebo test (c) estimate (d) placebo test

E. Ethiopia



(e) estimate (f) placebo test (g) estimate (h) placebo test

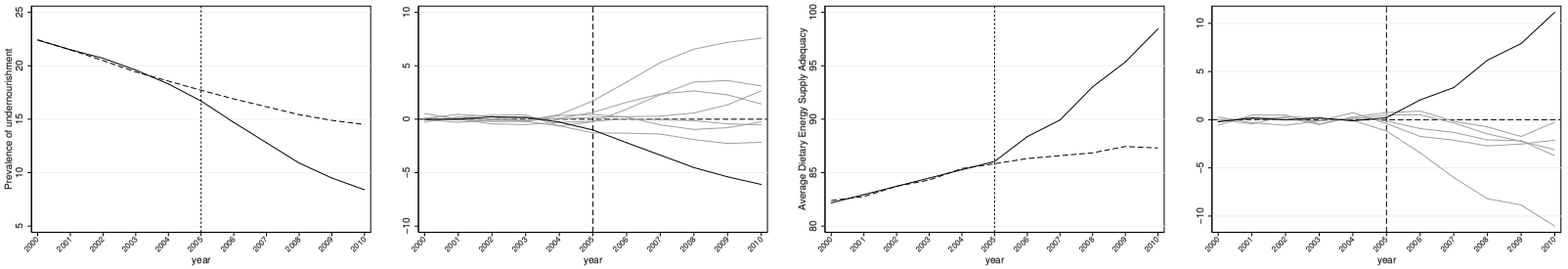
F. Kenya



(i) estimate (j) placebo test (k) estimate (l) placebo test

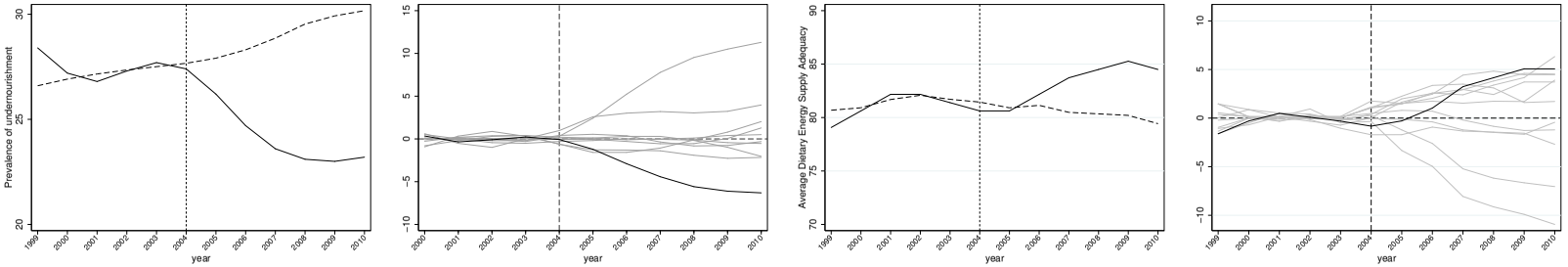
Notes: The solid line shows the real behaviour of the PU and ADESA indicators, whereas the dotted line indicates the pattern of the synthetic control.

G. Mali



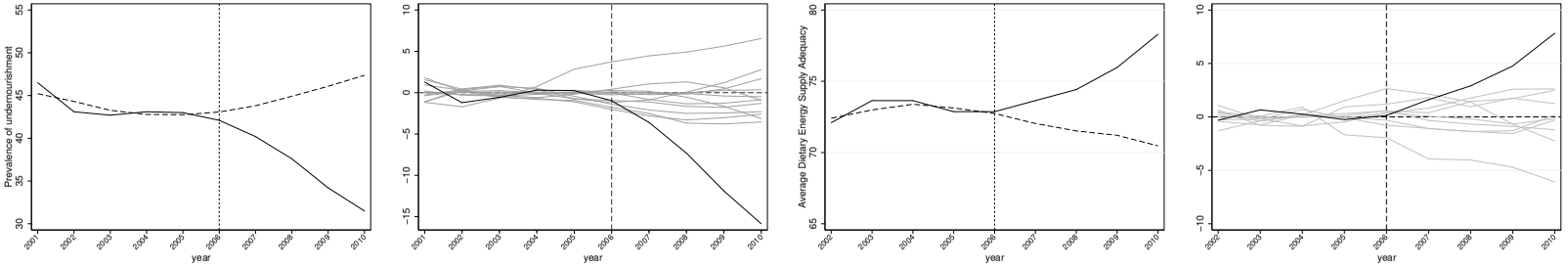
(m) estimate (n) placebo test (o) estimate (p) placebo test

H. Malawi



(q) estimate (r) placebo test (s) estimate (t) placebo test

I. Rwanda

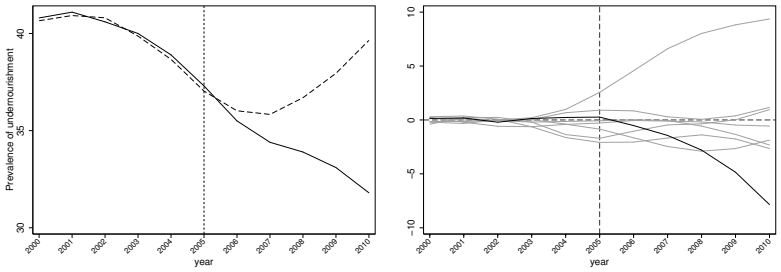


(u) estimate (v) placebo test (w) estimate (x) placebo test

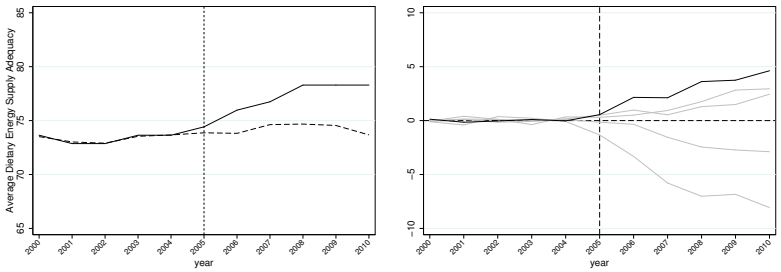
Notes: The solid line shows the real behaviour of the PU and ADESA indicators, whereas the dotted line indicates the pattern of the synthetic control.

Figure 3: Cash transfer policies and food insecurity, Fragile states

J. Sierra Leone

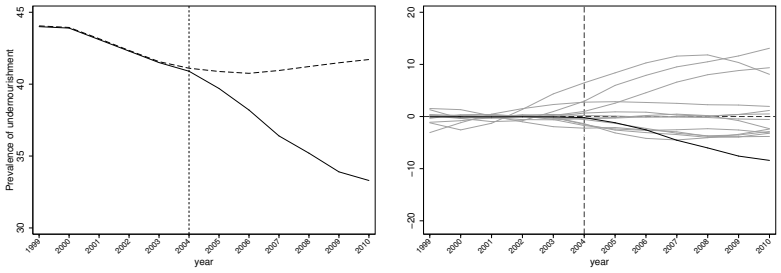


(a) estimate (b) placebo test

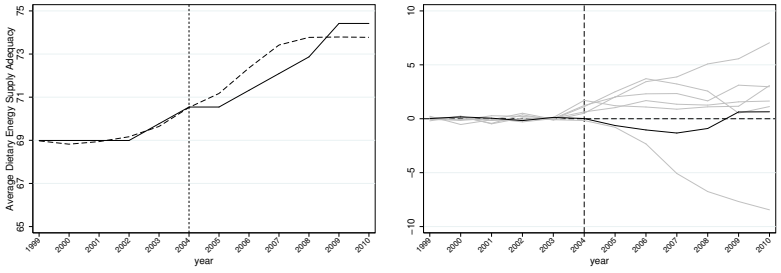


(c) estimate (d) placebo test

K. Zimbabwe



(e) estimate (f) placebo test



(g) estimate (h) placebo test

Notes: The solid line shows the real behaviour of the PU and ADESA indicators, whereas the dotted line indicates the pattern of the synthetic control.

Sierra Leone. The population interested in the food security improvement clearly varies with the dimension of the intervention. Moreover in some countries CTs induced an immediate increase of the adequacy of the dietary energy supply, which complemented the distribution effect of the prevalence of undernourishment. After three years, in Rwanda and Sierra Leone the ADESA outcome recorded an increase of more than 1.5 percentage point. The results kept similar conclusions when we refer to Mali, although the impact was greater and near to two percentage points after three years.

Table 6: Cash transfer effects on prevalence of undernourishment

Countries	Year of CT	Population previous year	Immediate effect		Average effect two years		Average effect three years	
			Variation	% Population	Variation	% Population	Variation	% Population
Ethiopia	2005	72,637.2	-0.05	49.40	-0.45	48.98	-0.93	48.48
Mali	2005	11,827.33	-0.69	35.73	-1.22	33.96	-1.60	32.78
Malawi	2005	12,796.8	-0.26	27.40	-0.99	26.55	-1.86	25.63
Kenya	2005	33,967.09	-1.00	16.70	-1.60	15.70	-2.18	14.73
Rwanda	2006	9,611.065	-0.97	42.10	-2.29	40.30	-3.96	38.47
Sierra Leone	2005	4,602.202	-0.26	37.30	-0.39	37.04	-0.74	36.65
Zimbabwe	2004	11,815.52	-0.20	40.90	-0.69	40.31	-1.31	39.66

Notes: Yearly effects of policy introduction on the prevalence of undernourishment, along with the two and three years averages, for each country.

Table 7: Cash transfer effects on average dietary energy supply adequacy

Countries	Year of CT	Population previous year	Immediate effect		Average effect two years		Average effect three years	
			Variation	% Population	Variation	% Population	Variation	% Population
Mali	2005	11,827.33	0.21	86.04	1.13	87.20	1.86	88.11
Rwanda	2006	9,611.065	0.13	73.00	0.87	73.74	1.55	74.41
Sierra Leone	2005	4,602.202	0.55	74.19	1.35	74.99	1.61	75.25

Notes: Yearly effects of policy introduction on the average dietary energy supply adequacy, along with the two and three years averages, for each country.

4.2. Discussion and policy implications

Our estimates provide some insights on the way in which CT implementation in sub-Saharan Africa has influenced food security policy outcomes, inferring that such interventions have positive

effects in the undernourishment of low-income and fragile countries. On the other hand, the results obtained for upper-middle income countries of CT policies are at least ineffective. The two upper-middle income countries considered here, Lesotho and Swaziland are individually representative and interesting for their specificity. Neither the introduction of the universal Old Age Pension in Lesotho in 2005 in order to reduce the effects of primary commodity price increases on the elderly nor the Old Age Grant for poor people over 60 introduced in Swaziland in 2005, had any appreciable effect on undernourishment.

A possible explanation is that Lesotho, like most of upper-middle income countries, has adopted a rights-based social protection system that already covers a wide range of vulnerable groups. Thus, the effect of various social policies - which we control in estimation with the inclusion of the mean of undernourishment indicator in the previous five years - may conceal the positive influence of CTs on undernourishment. In addition, the rapid increase in food prices after 2005 resulted in reduced purchasing power for pensioners, such as CTs became inadequate to meet the nutritional needs of this group (Croome et al., 2007).

In Swaziland, in contrast, we have a counterintuitive result: after CT implementation, the indicator of undernourishment increased. The explanation of this result may lie in the simultaneous food crisis that began to unfold its effects in 2005. In the wake of that crisis, CTs proved ineffective in Swaziland for two reasons: their lack of universal coverage and the huge administrative problems associated with the old age grant - e.g., high transfer and disbursement costs and fraud (Garcia and Moore, 2012). In fact, Swaziland is a peculiar case facing a number of long-term systemic problems, including the interaction amongst food insecurity, HIV/AIDS and drought, which cannot be addressed by the CTs in place[11].

The success stories are focused on low-income and fragile countries, in which CTs have been proved to be effective in enhancing undernourishment. It must be stressed that this analysis does not always clarify the transmission channel through which reductions in the PU is achieved. We speculate that the drivers of CTs' effects on food security improvements are linked with the short-term response of food purchases, made possible by changes in household income. In particular, given that food is a luxury for a large proportion of the population in poor countries, the share of food increases with additional income at low levels of total consumption distribution, an argument

[11] See, for a discussion, Masuku and Sithole (2009).

largely discussed by Ibrahim et al. (2007) using the Ethiopian Urban Household Survey. We emphasise that generally the CT programmes have been funded both by governments and foreign donors and administered by government institutions, with the universal aim of reducing the socio economic vulnerability of a large proportion of the population. In most of the cases, CTs have been part of the humanitarian response to emergencies (FAO, 2009; United Nations, 2009; Harvey et al., 2010). Examples of these policies addressed to combat the emergency are the "Productive Safety Net Programme-Direct Support" in Ethiopia and more general the cash transfers implemented in Zimbabwe and Malawi. In particular, the CT pilot programme in Malawi (the Social Cash Transfer Programme, funded by the government and UNICEF) was targeted to children's school enrolment and attendance and provided transfers to female household representatives (Miller et al., 2010, 2011). Given that these interventions aim at restoring the ex-ante crisis, the improvement in the prevalence of undernourishment is the expected result.

Instead, the CT programmes have had a positive and significant influence on both of undernourishment indicators in Rwanda and Sierra Leone because addressed to the post-conflict period and implemented with the involvement of local communities (Jones et al., 2005; Béné et al., 2012). These programmes to combat undernourishment were strategically involved in solving the lack of development, which allowed of stabilising the income for ensuring the minimum subsistence. Thus, in Rwanda the Child Soldiers Reintegration Grant is a short-term CT programme that addresses the post-conflict emergency but also helps individuals to start new occupations in post-conflict contexts (Sabates-Wheeler and Devereux, 2011). Also Sierra Leone's CT schemes (the Old and Needy and Reinsertion Benefits) have been implemented in the context of post-conflict recovery and with reference to the country's IMF-mandated Poverty Reduction Strategy Paper, which recommends the implementation of a social protection policy that takes the form of short-to-medium-term programme linking access to social services and food security (Holmes and Jackson, 2007). The beneficiaries were typically the elderly and those lacking a stable income, in accordance with the strategic objective providing social safety, net to the vulnerable and increasing social cohesiveness in the aftermath of the conflict. In summary, complementarities in development policies for the enhancement of food supply and poverty reduction in Rwanda or the experience of Sierra Leone show that the institutional arrangements are also of paramount importance in determining the effects of CTs on the quantitative measures of undernourishment (Devereux, 2009, 2012). This explanation

concurs with the views of Harvey and Homes (2007), Holmes and Jackson (2007) and Slater (2009) that social policy in the post-conflict context helps to provide an enabling environment for growth, bridging the gap between crisis and development.

Mali also improves both the undernourishment indicators, but this is a different case. Although in May 2005 a food security assessment was implemented in Mali to recover the financial crisis (Pietzsch, 2005), the CT programme likely exploited the administrative background of a CT pilot programme addressed to women (e.g., Bourse Maman), which was championed by UNICEF in 2001 (Holmes and Barrientos, 2009; Pereznieto, 2009). The length of the pilot programme appears to be a determinant of the supply calorie adequacy success, for example, with respect to Kenya. In fact, in Kenya the CT for Orphans and Vulnerable Children targeted to individuals living in HIV-affected household began as a pre-pilot in 2004 and then expanded in 2005 the scale and transfer attempting to condition transfers on human capital investment in children's health and education (World Bank, 2009) and determined an improvement only in the food insecurity distribution.

These findings are also interesting because provide evidence in favour of CTs focused on human capital investments and targeted at women and children. Recently, these CTs have sparked considerable attention for their role in combating hunger and promoting nutrition security (Bassett, 2008; de Brauw and Hoddinott, 2011; Hoddinott and Bassett, 2009; Hoddinott, 2010; Paes-Sousa et al., 2011). Our analysis supports Bassett's call for sub-Saharan Africa to promote policies that encourage groups at high risk of undernutrition (women and children) to utilise education and nutrition services, improve the quality of these services and the best practices in nutrition (Bassett, 2008).

5. Concluding remarks

In this paper, we estimate the effects of CT policies on undernourishment in a sample of African countries. We study the patterns of prevalence of undernourishment and average dietary energy supply adequacy amongst the fragile, low- and middle-upper income countries targeted by CT policies. The availability of similar countries that have not implemented these policies allows us to estimate the short-term effects of these programmes under a quasi-experimental framework.

The application of CTs programmes provides a useful test for their effectiveness in the sub-Saharan region. We find their introduction in low-income and fragile countries to lead generally to

a reduction in the prevalence of undernourishment over three years, although these policies resulted in no significant improvements in food security in countries classified in the upper-middle income counterparts. Although correlates forces may affect sparsely the results of the CT application on undernourishment, our results lead to conclude that CT policies are important where is large the reaction of food consumption to impulses in available income. The channels through which CTs activate the food consumption have been particularly effective where a development strategy was implemented, either linked to humanitarian or post-conflict emergencies or to comprehensive interventions to reduce poverty, particularly addressed to women. In these cases, it is evident also the increase in the average dietary energy supply adequacy indicator in addition to the improvement of the distribution of food.

More work is needed in this field. In particular, because CT programmes place strong emphasis on nutrition, providing advices on best healthcare and nutrition practices, it would be important to determine whether they are having the desired effects also on these outcomes.

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