Comparing the productive effects of cash and food transfers in a crisis setting: Evidence from a randomized experiment in Yemen

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Abstract: The productive impacts of transfer programmes have received increased attention. However, little is known about such effects in emergency and crisis settings. Even less is known about whether transfer type – a food basket or a cash grant – influences the productive potential of such transfers. Theory suggests that, while cash transfers can relieve liquidity constraints associated with investments, subsidized food provision, by acting as a form of insurance, may prevent households from retreating to conservative income-generating strategies during volatile periods. Using a randomized field experiment in Yemen, we contrast the effects of transfer modality. The results demonstrate a modest productive impact of both modalities and suggest a role for both liquidity and price risk channels. Cash transfer recipients invested relatively more in activities with higher liquidity requirements (livestock), while food recipients incorporated higher-return crops into their agricultural portfolios.

1. Introduction

Since 2005, the World Food Programme (WFP) has spent US$39.5 billion on emergency and relief operations.[1] In 2016, the US Government's food commodity programme budgeted over US$1.4 billion for emergency overseas food shipments. Such programmes aim to prevent catastrophes and stabilize food security. However, beyond the obvious humanitarian rationale for these interventions, a sizeable literature has also demonstrated the potential long-term benefits associated with preventing acute food crises. Such studies have focused primarily on outcomes

[1] The amount includes spending on emergency operations and on protracted relief and recovery operations and is in 2016 US dollars. The total is calculated from WFP annual performance reports.

related to nutritional deficits and food intake (Gilligan and Hoddinott, 2007; Hoddinott et al., 2013; Margolies and Hoddinott, 2012).

Increasingly, however, the development community and researchers have recognized that frequent negative shocks arising because of either conflict or natural disaster can severely impede the ability of a person or household to develop the necessary capacity to enjoy increases in living standards over time. While economists have long acknowledged the importance of the dynamic consequences of crises, the traditional division of aid implementation into emergency and development categories has slowed the integration of such ideas in practice (Barrett and Headey, 2014). Recent emphasis on concepts such as resilience, however, suggest more widespread understanding of these issues (Béné et al., 2012).

As a result, there has been growing interest in the productive impacts of transfer programmes, including those concerned with food assistance (for example, see USAID, 2016). A focus has been investments in agriculture, a key component of the livelihoods of many of the world's poor (Banerjee and Duflo, 2007). An omnibus review of the cash transfer evaluation literature notes that the much of the evidence stems from the Protection to Production Project of the Food and Agriculture Organization of the United Nation, which centred explicitly on the potential role of cash transfers in raising agricultural productivity in sub-Saharan Africa (Bastagli et al., 2016). The results of the project and other evaluations have been mixed. The direction and size of outcomes vary from study to study; the most consistent, positive outcomes occur in small-livestock ownership and input purchases (Daidone et al., 2017).[2] The context of many of these evaluations do not include a background on civil conflict or acute need.

At the same time that researchers have reconsidered the potential outcomes of transfer programmes, there has also been a reassessment of the programmes. Despite a long history of providing food assistance through reliance on food commodities, agencies have begun to shift to alternative modes of assistance, particularly cash and vouchers (Alderman, Gentilini, and Yemtsov, 2018; Lentz, 2014). A plethora of high quality randomized evaluations have examined the relative impact of the choice among food assistance modalities on factors associated with nutrition, consumption, expenditure, and cost (Aker, 2017; Cunha, 2014; Hidrobo et al., 2014;

[2] See, for example, evaluations of social cash transfer schemes in Kenya and Malawi (Asfaw et al., 2014; Boone et al., 2013). Our focus here is on productive impacts among treated individuals, though local economy effects may potentially be significant (Taylor and Filipski, 2014).

Hoddinott, Sandström, and Upton, 2014). Most confirm that cash and voucher recipients consume a greater diversity of foods relative to commodity recipients. However, little is known about the productive implications of each modality.[3]

This paper contributes to both the literature on the productive impacts of social protection and the literature on the differential impacts of modality choice in food assistance. We study a food assistance intervention implemented by the WFP in rural Yemen in 2011 and 2012. Communities in the study were randomly assigned to receive three equal-valued food or cash transfers worth nearly US$50 each.[4] We focus on the impact of these transfers on production according to two measures: first, in relation to each other (relative impacts) and, second, relative to villagers who did not receive the benefits (absolute impacts). The transfers arrived when violence, civil unrest, and uncertainty were sporadic in Yemen, that is, before the full-scale onset of constant violence.

While cash transfers may directly address the liquidity constraints on productive investment, food transfers may have particular benefits among households engaged in non-commercial agricultural production. In particular, a food transfer may take on a consumption insurance function similar to the role of foodcrop production and may thus alleviate the risk constraints associated with the production of higher-value crops or off-farm labour. Given the uncertainty prevailing at the time of the transfer, the insurance benefit of self-sufficiency in food production (or of food transfers) increases with the degree of expected price volatility (Fafchamps, 2003).

Our findings suggest that the transfers likely affected both liquidity and risk constraints, though the scope of the productive impact was modest. Cash transfers, but not food transfers had a positive impact on small-livestock acquisition. Consistent with theory, however, food transfers positively and differentially affected the likelihood farming households would plant cash-crops. Both types of transfer boosted the amount of off-farm wage-work, but there was no relative difference in adult or child labour.

The results here speak directly to a recent literature that has attempted to unpack the link between social protection strategies and productive investments. In a large randomized trial in the Northern Region in Ghana, Karlan et al. (2014) find that a sizeable cash transfer of US$85

[3] Hoddinott, Sandström, and Upton (2014) report that cash recipients spent relatively more on input use during one growing season in Niger.
[4] The precise value of each transfer at market exchange rates at the time of the first transfer was US$49.07.

per acre (an average US$420) had relatively little impact on agricultural production, while a rainfall insurance intervention had large productive impacts. Their findings point to risk as the binding constraint, and, similar to our study, they note that farmers with the insurance engage in riskier, higher-value production.

However, a series of recent randomized trials suggests that liquidity constraints are indeed significant among farmers in sub-Saharan Africa. In Senegal, Ambler, de Brauw, and Godlonton (2017a) find that a US$200 cash transfer, coupled with an agricultural extension programme, increased livestock holdings and had a broadly positive impact on overall crop production. Ambler, de Brauw, and Godlonton (2017b) find that a US$84 cash transfer in Malawi (in cash or partially in inputs) led to an expansion in both livestock holdings and the value of agricultural production, particularly cash-crops. In Mali, Beaman et al. (2015) find that a US$150 cash grant, the same magnitude as the transfer studied here, led to positive impacts on agricultural production among liquidity-constrained farmers likely because of greater expenditures in inputs and in investment.

As in the case of Karlan et al. (2014), the results here show that food transfers, which may be a particularly important form of insurance during periods of expected price volatility, can enable farmers to engage in riskier, but higher value activities. But cash recipients do appear to use at least part of their grants for agricultural investment, especially in livestock. This suggests that evaluations of the productive impacts of transfer programmes should be clearer about the role of expected effects in the production process, especially among farmers engaged in subsistence production. Our findings also provide a potential explanation for the heterogeneity of results in the broad literature on transfers and production: the expected price volatility of a staple foodcrop during an intervention may influence the extent to which transfers enable an optimal swap to a higher-value, but riskier production strategy or simply alleviate liquidity constraints on investments in current production.

Transfers appear to raise off-farm labour participation, but the transfer modality does not change the impact. However, unlike de Hoop, Groppo, and Handa (2017), we do not find that transfers increase labour participation by children. Though we are unable to measure the excessive work performed by children, we estimate a small negative effect of the receipt of transfers at the extensive margin of child labour and find no differences by modality. These results should, however, be interpreted with caution because the timing of the survey impedes our ability to disentangle transfer impacts from the effect of the start of the school year.

We also note that the results here may help interpret the broad message of many of the experiments comparing the consumption impacts of cash and food transfers. In an analysis of the same intervention examined here, Schwab (2013) finds that, relative to food beneficiaries, cash recipients consumed a more diverse diet, including more nutritious foods sourced from animals. The discrepancy occurs although the food transfer amounts were inframarginal over the two-month period each transfer is designed to support. One contributing factor may be that food transfer recipients switching to cash-crop production may have temporarily shifted to a more cereal-intensive diet in anticipation of a relatively more diverse diet after realizing their returns on cash-crops. While not directly testable, the explanation is consistent with a staple food transfer that alleviates risk constraints.

The article is organized as follows. The next section provides a conceptual model for understanding the different impacts of each transfer type and provides background on the Yemeni context. The subsequent section details the intervention and empirical strategy. The section thereafter presents the data. The penultimate section shows the results, and the final section concludes.

II. Conceptual Model and Background

Cash and Food Transfers

For a household that purchases food at a market, standard microeconomic theory predicts that the modality of an equal valued, inframarginal transfer should have no bearing on productive impacts. In such a case, a household's food consumption and disposable income would increase by the same amount from either a food transfer or a cash transfer. However, aside from the lack of consistent support for this standard model in the literature, the applicability of the model to small farmers in rural settings is questionable because of the seasonality of income patterns and the consistent rejection of the assumption of fully separable household consumption and production decisions (Arslan and Taylor, 2009; Gentilini, 2014; LaFave and Thomas, 2016). As a result, the potential for a productivity difference by modality is highest among subsistence or semi-subsistence farmers in rural settings.

The potential productive superiority of transfers in cash is fairly straightforward. Boone et al. (2013) note that credit and liquidity constraints are widely considered key barriers to productive investment by small farmers. Seasonal income patterns may exacerbate this problem because farmers lack the facility to purchase inputs at appropriate times. Among farmers who may be consuming from own consumption due, for example, to high transaction costs, obtaining liquidity in the absence of credit markets by selling production would require a reduction in the total consumptive value of a harvest (Key, Sadoulet, and de Janvry, 2000). Thus, a timely cash transfer, as opposed to additional food stocks, would permit households to make investments that would be suboptimal in the absence of such liquidity.

Other barriers, including risk, may persist and bind. Thus, in the face of food price risk, farmers often find that the optimal strategy is insurance through greater foodcrop self-sufficiency (Fafchamps, 1992). Theoretically, the extent to which farmers sacrifice potentially higher returns to cash-cropping because of such risks depends on several factors, including the household share of income devoted to food, the degree of risk aversion, and income elasticity, as well as the covariance of cash and foodcrop prices and returns. However, under reasonable conditions, more risk averse farmers are more likely to self-insure through self-sufficiency (Fafchamps, 2003).

In simulations based on this theoretical model, Fafchamps (2003) explores a variety of conditions relevant to the Yemeni case analysed here. The results show that growth in food price volatility increasingly harms less market integrated, poorer households, as "it induces them to maintain a high level of food self-sufficiency" (Fafchamps, 1999, p. 77). The implication drawn from the models is thus that the availability of subsidized food can increase cash production by enhancing the supply responsiveness of small farmers to market conditions (Fafchamps, 2003).

An inframarginal food transfer, like the one analysed here, represents a 100 per cent subsidy for a portion of the household's food needs and reduces the price variance of the overall bimonthly food budget. Thus, the incentive to increase food production, that is, a self-sufficiency strategy, would be less powerful among food beneficiaries relative to cash beneficiaries. In the case of Yemen, where the civil unrest and potential for conflict could impact both price volatility and market access by individuals, the effect of food transfers on risk constraints may be non-trivial.

In a review of some of the key conceptual models and empirical evidence on barriers to market participation among smallholders, Barrett (2008) notes the potential significance of price volatility. This role is found to be empirically significant in Madagascar by Cadot, Dutoit, and Olarreaga (2006), as well as an important part of the contract farming decision (Minten, Randrianarison, and Swinnen, 2009). In addition to cash-cropping effects, Barrett (1996) notes that price risk may cause net food buyers to overinvest in agricultural production more generally. In that case, a food transfer (relative to cash) may result in higher labour intensity devoted to off-farm production.[5]

Though, in the case examined here, the scope and duration of the transfers were limited and the procurement of the commodities was mainly domestic, Barrett and Maxwell (2006) find that food transfers that destabilize local markets could increase overall volatility.

The Yemeni Context

The intervention takes place in rural areas of two governorates: Hajjah and Ibb. While they differ in some agroecological characteristics, both governorates receive substantial amounts of precipitation relative to the rest of the country. Agricultural production in both has a long and storied history and remains widespread. While some areas of Ibb have a short rainy season in the spring (when pulses are mainly produced) and long summer rainy season (cereal production), Hajjah has only one rainy season, in the summer. In both areas, cereal crops are planted in the spring and harvested in the fall.

In both governorates, sorghum is the most important cereal crop. In our sample, between 70 per cent and 75 per cent of farmers grow sorghum in the regions. Sorghum is an important foodcrop and source of animal feed. The WFP (2012) has estimated that 53 per cent and 54 per cent of households in Hajjah and Ibb, respectively, are food insecure.

Yemen's most important cash-crop is kat, a flowering, perennial plant that is native to the Horn of Africa and the Middle East. The leaves, which are mildly narcotic, are popular in Yemen, where they are chewed as a stimulant. Though much maligned for its water consumption and potential health effects, kat likely remains Yemen's most profitable crop (Fielding-Smith, 2010; Zahran et al., 2014). Milanović, (2008) estimates that approximately 70 per cent of Yemeni chew kat leaves, though, in our sample, less than one third of households consume the plant daily, and about half chew once per week. The plant is highly perishable, though well-developed marketing channels

[5] An implication of this model is that, in comparison with food transfers, the relatively higher share of investment in agricultural inputs associated with cash transfers may generate a relative expansion in agricultural productivity, but a relative decline in overall economic output by households.

transport the crop from producers to markets daily, and it can thrive even in poor soils (Kennedy, 2012).

Though we do not directly measure future expectations, it should be uncontroversial that uncertainty about future market conditions was high among the sample of households at the time of our data collection. At the time of the baseline survey in fall 2011, the effects of the Arab Spring were reverberating throughout the country. Yemen's then president, Ali Abdullah Saleh, was in the process of returning to the country after receiving treatment for a bomb attack that followed his refusal to agree to a regional accord calling for a transition to a new government administration. Over the course of the cash and food transfer period, Saleh officially ceded power to his deputy, ending a 33-year rule. Against this backdrop, a separatist campaign in the south intensified; Islamist elements asserted growing local power; tribal hostilities continued, and the long-simmering revolt of the supporters of Houthis in Sa'dah, adjacent to one of the study sites, strengthened. Ex post, uncertainty about the future would have been justified, as the Houthis would eventually sweep across much of Yemen, igniting an ongoing, full scale civil war involving regional powers. While the supply of food commodities at the time of the endline survey was normal, the volatility of prices over the previous year was high (WFP, 2012).

There is also evidence that liquidity constraints may have been relevant among rural Yemeni. Sawada and Zhang (2012) find that liquidity concerns were important in the majority of business closures in their rural Yemeni sample. However, they also note that households with higher agricultural incomes were less likely to close non-farm businesses, suggesting that food production may be used as insurance in livelihood strategies.

III. Intervention and Empirical Strategy

Intervention

The WFP distributed cash and food transfers in the communities sampled for this study over approximately eight months between August 2011 and April 2012. The transfers were part of a broader emergency safety net initiative designed to assist severely food insecure households across the country.[6] The initiative was prompted by a widespread economic, political and social crisis, which included not only conflict and civil unrest, but also the erosion of real incomes amid severe price volatility associated with staple goods (Breisinger et al., 2011). The transfers examined here were part of a pilot programme funded by the Spanish Government and integrated into the initiative.

Two governorates, Hajjah and Ibb, were selected to host the pilot programme. Within these two governorates, 136 village clusters, hereafter referred to as food distribution points (FDPs), participated in the evaluation. The FDPs were randomly assigned to receive either three cash transfers or three food transfers over the study period. The randomization was stratified by governorate.

Only eligible households within each FDP received the transfers. Eligibility was determined by a proxy-means test carried out by the Social Welfare Fund and the World Bank in 2009. Proxy-means scores were used to categorize households into groups based on need. Group A households, at one extreme, were the most in need of immediate assistance, and group F households, at the other extreme, did not need any assistance. For the pilot exercise, households in groups A and B were deemed eligible to receive transfers (beneficiaries), while those in groups C or above did not receive transfers (non-beneficiaries). Data were collected on households in groups A, B and C.

Schwab et al. (2012) apply the identical proxy-means test methodology using data collected in the baseline survey round. They conclude that, while beneficiaries had lower scores than non-beneficiaries on average, there was substantial overlap in the distribution of the two groups.[7] The overlap suggests that the baseline survey measurements of some household characteristics differ from those obtained during the original proxy-means exercise either because of reporting differences or changes in circumstances over the two-year gap between the two data collection periods.

Beneficiaries in food transfer FDPs received a basket consisting of 50 kilograms of wheat flour and 5 litres of vegetable oil per transfer. The size of the food basket was based on a presumed daily

[6] The emergency safety net initiative was one component in a larger, two-year protracted relief and recovery operation, an administrative category the WFP reserves for post-disaster relief and stabilization programmes.

[7] In addition, we are unable to determine if the original proxy-means test classified beneficiaries according to whether they belonged to group A or B.

calorie gap of 500 kilocaleries per person per day, and the size of the cash transfer was then calibrated to match the local market value of the food items at the time of the initial disbursement. Cash beneficiaries received slightly more than US$49 (YER 10,500) per transfer.

Though the modality type was randomly assigned, and the transfer value was designed to be equivalent, implementation difficulties caused a discrepancy in the timing of transfers. Ideally, the disbursement schedule would be identical for both food and cash transfers, so that modality differences would be orthogonal to seasonal influences or other factors associated with the exact timing of the receipt of the transfers. However, in the intervention studied here, food transfers were launched earlier than the cash transfers, and the lag between transfers was thus longer in the case of the food transfer group. In particular, the first food transfer was delivered in August 2011; the second in late October, and the last in early April 2012. The first cash transfer became available in November 2011; second in January 2011, and the last at the end of February 2012.[8]

In addition, the first food transfer (but not the first cash transfer) occurred after the baseline survey. While this limits the ability to use the baseline data for certain comparisons, this paper focuses on household decisions unlikely to be overly influenced by the timing of the first food transfer. Importantly for the outcomes considered here, there were no differences in time with respect to planting decisions. The first two food and cash transfers occurred after the 2011 planting cycle, and the last transfer occurred during the period of land preparation and planting for the 2012 cereal crop season.[9] Because the majority of the outcomes represent relatively long-term investments, such as livestock purchases or crop choice, we include the baseline data in the analysis.[10]

Empirical Strategy

The empirical approach here exploits the assignment of modality type (cluster randomized), the sampling of beneficiaries and non-beneficiaries (non-random), and the panel structure of the data

[8] Beneficiaries had a 25-day window to pick up cash transfers from local post office branches; so the exact timing of receipt varied by household.

[9] Because of regional differences in agroclimactic conditions, the last food transfer among some households in some areas may have occurred following sowing. See 'Yemen Seasonal Calendar', Yemen Food Security Information System Development Programme, Ministry of Planning and International Cooperation Sana'a, September 2014, http://fscluster.org/sites/default/files/documents/yemen_seasonal_calendar_english_final_23-12-14.pdf.

[10] In contrast, Schwab (2013), who uses the same dataset, excludes the baseline data from impact estimates of food consumption, which relies on a seven-day recall period.

(baseline and endline). We focus on two classes of effects on productive activity and investment: (1) the relative impact of food and cash and (2) the absolute effect of each modality.

To estimate (1), we focus only on beneficiaries. For this group, we estimate changes between baseline and endline within food and cash clusters, that is, a difference in differences among the benefit-eligible group only. We refer to this measure as the relative difference in differences (RDiD). For any outcome, $\boldsymbol{Y}$, we can write the average value by treatment modality (subscript $\boldsymbol{M}$ or $\boldsymbol{F}$ for money or food), eligibility group (subscripted by $\boldsymbol{E}$ or $\boldsymbol{N}$ for eligible or non-eligible), and survey round t (1 or 2) and define it as follows:

$$\boldsymbol{RDiD} = (\overline{\boldsymbol{Y}}_{\boldsymbol{FE2}} - \overline{\boldsymbol{Y}}_{\boldsymbol{FE1}}) - (\overline{\boldsymbol{Y}}_{\boldsymbol{ME2}} - \overline{\boldsymbol{Y}}_{\boldsymbol{ME1}}) \qquad (1)$$

For household $\boldsymbol{i}$, living in cluster $\boldsymbol{c}$, the regression model to estimate the RDiD can be written as follows:

$$Y_{ict} = \alpha + \beta_1 F_{c|e=1} * Post_t + \beta_2 Post_t + \beta_3 F_{c|e=1} + \delta X_{ict} + \varepsilon_{ict}, \qquad (2)$$

where $\boldsymbol{F}_{\boldsymbol{ic|e=1}}$ represents a dummy variable equal to one if the beneficiary household resides in a food FDP and 0 if the beneficiary resides in a cash FDP, and $\boldsymbol{X}_{\boldsymbol{ict}}$ is a vector of household control variables, which includes a dummy variable for governorate (the randomization stratum). Other variables included are household size, gender, education and marital status of household heads, and baseline values of an asset index.

To estimate absolute effects, we incorporate the non-beneficiaries. To obtain consistent estimates, we must difference out the disparity between these non-eligible households and the beneficiaries because their beneficiary status is not randomly assigned. The difference in differences strategy thus takes differences between these groups (within a treatment area) in each round. We can then use an absolute difference in differences (ADD) estimator to examine impacts separately for each modality, as follows:

$$ADD_F = (\overline{\mathrm{Y}}_{\mathrm{FE2}} - \overline{\mathrm{Y}}_{\mathrm{FN2}}) - (\overline{\mathrm{Y}}_{\mathrm{FE1}} - \overline{\mathrm{Y}}_{\mathrm{FE1}}) \qquad (3)$$

$$ADD_M = (\overline{\mathrm{Y}}_{\mathrm{ME2}} - \overline{\mathrm{Y}}_{\mathrm{MN2}}) - (\overline{\mathrm{Y}}_{\mathrm{ME1}} - \overline{\mathrm{Y}}_{\mathrm{ME1}}) \qquad (4)$$

The regression model for the ADD estimators for a given treatment is specified as follows:

$$Y_{idt|c=F,M} = \alpha + \beta_1 Elg_{idc=F,M} * Post_t + \beta_2 Elg_{idc=F,M} + \beta_3 Post_t + \delta X_{idt|c=F,M} + \sigma_d + \varepsilon_{idt|c=F,M}$$

(5)

The term $\boldsymbol{\sigma_d}$ indicates a fixed effect in a subdistrict (*uzla*). This fixed effect captures differences between eligible and non-eligible households that vary within a locality.[11] Finally, we compare the sizes of the absolute effects for each modality using a triple difference estimator, which can be written as the difference in difference in differences (DDD) between modalities and estimated within a single regression, as follows:

$$DDD = \mathrm{ADD_F} - \mathrm{ADD_M} \qquad (6)$$

A positive triple difference coefficient indicates that the change in the outcome variable for food beneficiaries relative to non-beneficiaries exceeded the change for cash beneficiaries relative to

[11] In the ideal case, the use of cluster-specific fixed effects would provide consistent estimation under slightly less restrictive assumptions. However, as described in the next section, some FDPs did not contain sufficient numbers of non-eligible households. In such instances, additional households from FDPs within the same subdistrict were drawn as replacements.

non-beneficiaries. In other words, food provided recipients with a bigger boost in the outcome over time relative to their neighbors than cash. A negative coefficient would indicate the opposite case.

We also implement another approach to the non-random assignment of treatment eligibility using a form of matching based on the probability of treatment. As proposed by Heckman, Ichimura, and Todd (1998), kernel matching is used to weight the observations based on closeness of propensity scores. These kernel weights, which effectively limit the influence of non-beneficiaries that appear unlikely to be treatment eligible, are then integrated into the basic regression adjustment estimates of the ADD and DDD.[12]

The initial propensity scores are estimated using a logit regression of treatment eligibility on variables used by the Social Welfare Fund to determine the proxy-means scores originally used to determine eligibility groups. These include household size, numbers of children attending or not attending school, housing characteristics (floor material, water source), household head characteristics (gender, literacy, marital status), and asset ownership (televisions, phones, sewing machines).

The results using the kernel matching approach appear in the annex. For all regressions, a bandwidth of .004 is used, which is based on the upper limit of the optimal bandwidth derived from a pair-matching algorithm.[13] Throughout the paper, we maintain focus on the non-weighted results because the estimates are substantially similar, and inference in the former is more straightforward.[14]

IV. Data

Surveys and Measurement

The original survey sampling strategy called for randomly selecting 15 beneficiary households and 11 non-beneficiary households from each FDP. However, a full complement of 11 group C non-

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[12] A similar approach is taken by (Asfaw et al. 2014) in their analysis of the productive impacts of a cash transfer programme in Kenya. As with the inverse probability weighted regression adjustment technique, the use of the kernel weights provides a doubly robust estimation property (Hsu et al. 2016).
[13] The kmatch command in Stata is used to identify the optimal bandwidth. While there is considerable debate about bandwidth selection for kernel matching, Huber, Lechner, and Wunsch (2013) find low sensitivity of the estimator across reasonably chosen values.
[14] The matching results yield slightly larger treatment estimates for most outcomes.

beneficiary households could not be located in every FDP. In such cases, replacement households were drawn from FDPs within the same district and treatment assignment. In total, 14 FDPs (seven food and seven cash) had less than 11 non-beneficiary respondents, and seven less than six, in the original sampling frame. The baseline survey was conducted in September and October 2011, and the endline survey in April and May 2012.

The sample used for analysis consists of a balanced panel of 3,350 households surveyed in both rounds. Of the households in the original sampling frame, but excluded here, only 26 were lost to pure attrition. The largest number of excluded households, 56, were beneficiary households discovered to include multiple members receiving transfers.[15]

The outcomes considered here can be classified into the following categories: crop choice, livestock, agricultural assets, expenditure, land investment, and labour. Crop choice variables are derived from a plot roster that collects data on the crop grown in 2011 (baseline) and the crop grown (or planned to be sown) in 2012 (endline). The indicators used here aggregate the plot information into a single dummy variable equal to one if the relevant crop is grown or planned to be grown on any of the household's plots. Four such aggregates were created, as follows: *anycrop* indicates whether any crop is planted in any of the plots, that is, not fallow or pasture only; *anycash* indicates whether any non-cereal or pulse crop is sown on any household plots; *anyqat* indicates whether kat is planted on any plots, and *anywheat* indicates the planting of wheat. An additional dummy outcome variable is also generated that is equal to one if all plots in a given round are devoted to sorghum.

Livestock numbers are taken from a livestock roster, where the cattle category aggregates bulls, cows, and oxen. In addition, all livestock (excluding beehives) are aggregated to calculate the total tropical livestock units owned by the household in each round.[16] Values are self-reported replacement costs, whereby respondents estimated the value if the purchase were made at the time of the survey.

[15] Also excluded were households on which there was incomplete data for key sections, and group C households that self-reported transfer eligibility. The resulting sample consists of 19 (of 136) FDPs with less than 15 beneficiary households; 15 of these 19 had 14 beneficiary households. In addition, 63 FDPs had fewer than eleven non-beneficiaries; 45 had ten, and ten had nine.

[16] Conversion rates are as follows: cows (.7), bulls and oxen (1), sheep and goat (.1), camels (1), donkeys (.7), and poultry (.01).

For six different categories of assets (ploughs; small implements such as sickles, axes and hoes; large assets such as water-pumps, motorized tillers and carts; hand-grinding mills; knapsack chemical sprayers; and tractors), respondents report the number owned by any member of the household. As with livestock, the asset values are self-reported replacement value estimates. Data on agriculture expenditure reflect a 30-day recall period, whereby respondents are asked to estimate the amount spent on farm inputs, equipment and veterinary expenses. Expenditure on debt repayment is also based on a 30-day recall period. Land investment variables are calculated based only on endline survey data, whereby respondents are asked if they have made any investments in their plots, changed their irrigation systems, or modified their plot areas since the baseline round.

Labour data are gathered for all household members 10 years of age or older. Several aggregates are constructed based on the data, which rely on a four-week recall period. First, we define dummy variables equal to one if any household member reported working for a wage or devoting time to off-farm self-employment during the recall period. We also provide a raw count of the number of household members performing wage work and off-farm self-employment. In addition, households were asked to provide the hours each member devoted to their self-reported primary occupation. We use this to calculate household off-farm hours worked per worker by aggregating the total hours, across members, of each respondent who reports either wage or off-farm self-employment, and then dividing by the total number of household members aged 10 years or older. In addition, we focus on the extensive margin of child labour by examining whether any children worked either on- or off-farm.

Because of the large number of outcomes for which we estimate treatment effects, concerns about multiple comparisons arise. In particular, the probability of rejecting a true null-hypothesis increases with the number of independent tests. We therefore also estimate p-values based on the resampling method of Westfall and Young (1993) as implemented by Jones, Molitor, and Reif (2018). An advantage of this method is that outcomes are not assumed to be independent, which allows for effective control of the familywise error rate without drastic loss in power.[17] The Westfall-Young p-values calculated here are used to account for the multiple tests of outcomes within the same category (for example, livestock).

[17] The simulations in Jones, Molitor, and Reif (2018) indicate that the resampling method preserves power more effectively than methods such as the Bonferroni adjustment.

Balance and Summary Statistics

To examine the observed performance of the randomization and the differences between beneficiaries and non-beneficiaries, means at baseline of outcome variables and household characteristics are compared across transfer type and treatment status (table 1). No outcome or characteristic of beneficiaries differs significantly by modality at the 5 per cent level. However, the probability of kat production is higher among cash recipients, as is the total value of agricultural assets, and the difference is marginally significant. The beneficiary group reports indicate that they hold consistently more livestock than non-beneficiaries. The direction of the difference is the same in the cash and food modalities, though the split is slightly larger in the food group, especially for poultry. Based on the tropical livestock unit aggregation, beneficiaries hold the equivalent of one cow and two goats or sheep, while non beneficiaries have the equivalent of one cow (in food FDPs), or one cow and one sheep or goat (in cash FDPs).

More closely reflecting the targeting criteria, beneficiary households are larger and less likely to be headed by an individual who has completed primary school. However, non-beneficiaries and beneficiaries have similar scores on a standardized wealth index based on asset ownership (last row) and are less likely to be woman-headed. Off-farm wage work is slightly more common among non-beneficiaries, among whom 46 to 50 per cent of households have a wage labourer, than among beneficiaries, among whom 42 to 44 per cent of households have a wage labourer. Rates of child work are also substantially higher among beneficiaries (21 to 23 per cent) relative to non-beneficiaries (12 to 14 per cent).

V. **Results**

Crop Choice

The first set of results gauges the relative and absolute impact of the transfers on crop choice. These estimates are restricted to the sample that reports owning or operating land at baseline. The first row of table 2 contains estimates of the RDiD, that is, the impact of food relative to cash on the dependent variable given in the column header. Relative to the cash treatment group, beneficiaries in food clusters were 1 percentage point more likely to cultivate any type of crop on their land.

To test whether the food transfer affected the choice of crops, we examine the probability of growing any type of cash-crop, kat (which is widely transacted), wheat (a higher-value cereal), or a sorghum monocrop (the most conservative portfolio). Assignment to a food transfer, relative to a cash transfer, increased the likelihood of cash-crop production by 2 percentage points (9 per cent), the likelihood of kat production by 3 percentage points (15 per cent), and of wheat production by 1 percentage point (20 per cent). These estimates are all significant at the 5 per cent level, with multiple comparison adjusted p-values ranging from .07 (kat) to .11. In contrast, no significant difference was found in growing sorghum alone.

The absolute impacts of each modality on crop choice are found on the third and fifth rows of table 2. These results are taken from difference in differences regressions estimated only on the FDPs assigned to a particular modality (cash or food), where the control group consists of non-beneficiaries living in the same subdistrict. The estimates suggest that the positive relative impact of food on crop choice is driven by an increase (relative to the controls) in cash-crop adoption between baseline and endline, as well as a small decline in the cash group. The impact estimates suggest that food transfers caused a 2 percentage point (12.5 per cent) increase in the likelihood of kat production, and the effect was significant at the 5 per cent level. Cash and food beneficiaries reduced the likelihood they would grow only sorghum by the same magnitude.

The last row combines the RDiD and ADD strategies in one DDD regression for the entire sample. As suggested by the previous estimates, the change for food beneficiaries relative to controls between baseline and endline exceeded the change for cash beneficiaries for cash-crops and kat adoption. While the Westfall-Young p-values fluctuate between significance at conventional levels or slightly above, examining the data more closely reveals that the results are driven by a small, but clear pattern of increased cash-cropping among food beneficiaries between the survey rounds. For example, the food beneficiaries account for 85 per cent of the net growth in the extensive margin of kat production between rounds. Matching results (annex A, table A.1) are consistent with this pattern, finding an even larger DDD estimate of 5 percentage points.

Taken together, these estimates support the hypothesis that food transfers serve to alleviate risk constraints to the adoption of higher-value, non-food foodcrops. As a perennial crop, the increase in kat growth represents a significant shift in future production strategies induced by the food transfer. However, the small magnitude of the changes suggests that the transfers alleviated the risk constraint to cash-crop adoption among only a small share of households because of insufficient transfer size, the presence of other binding constraints, or the lack of a binding risk constraint among the majority of beneficiaries.

Livestock

Though food transfers appeared to boost cash-crop production, particularly in relation to cash transfers, the opposite holds true for livestock (table 3). Cash beneficiaries increased their total livestock units by 0.12 (15 per cent), the equivalent to a sheep or goat. No overall change among beneficiaries was detected in food FDPs, and negative and significant impacts were found for poultry and beehives. Positive livestock changes for cash beneficiaries were driven primarily by small ruminants, camels and donkeys, and poultry; conventional and Westfall-Young p-values were less than .025. The DDD indicates that the relatively large impacts for cash are highest for tropical livestock units and poultry; the size of the latter estimate represents nearly 100 per cent of the baseline mean (though less than one chicken). The magnitude of the modality difference in tropical livestock units is approximately one sheep or goat.

Estimates using livestock value, as opposed to number of animals, reveal a similar story (table 4). These self-reported values may reflect quality differences not captured by raw quantities. Cash transfers raised the value of herds by approximately US$60. The estimate is 40 per cent of the total transfer value, though it is significant only at the 10 per cent level. Food transfers did not appear to have much impact on livestock holdings, though the relative difference between food and cash is smaller in the small ruminant category. However, estimates using kernel matching techniques suggest the magnitude of the positive cash effect on livestock value is approximately half the unweighted estimate (annex A, table A.3).

Agricultural Investment

The next set of estimates considers the impacts of transfers on the ownership of agricultural assets (table 5). The RDiD estimates indicate that the impact of cash transfers exceeded those of food in several asset categories, but the only significant difference is in large farm-tools. The relative impact on total value is higher in the cash group, but the point estimate is imprecisely estimated. The overall null difference is driven largely by the fact that both food and cash transfers appeared to raise the number of small farm-tools owned by households by between .3 and .36, respectively, against a baseline mean of 2.3 (14–16 per cent). However, only the cash transfer significantly increased large tool ownership, though by only .06 of a tool. The total value of assets was not significantly affected by either transfer.

The change in the extensive margin of expenditure on agricultural and debt was relatively larger in the cash treatment than in food (table 6). However, the individual impacts of either modality were either null (debt) or negative and marginally significant. No effect was found on the intensive margin for either modality or expenditure type.

During the endline survey, households were also asked about any investments they had made in land. Table 7 presents the results of the regressions, which rely exclusively on endline data, as the dependent variable represents a change between survey rounds. The first row (SD) estimates the relative effect of food to cash for the beneficiary sample only. Relative to the cash group, food beneficiaries appeared to cultivate only slightly less land. However, the result disappears when non-recipients are included as a control group (row 2). Under this endline double difference specification, cash beneficiaries are 3 percentage points more likely than food recipients to have invested in an irrigation system.

Off-Farm Labour

The final set of outcomes examined here involve the labour of household members. We find little to no relative difference in impacts on off-farm labour or child labour by modality. However, both food and cash beneficiaries were more likely to work for a wage, and both treatments increased the hours worked off-farm by over an hour per worker (nearly 25 per cent).[18] In addition, the extensive margin of child labour declined in both food and cash households by similar magnitudes (4 and 3 percentage points, respectively), though only the former's estimate is significant. As a result, we do not find strong support for the theory that food transfers differentially alleviated a risk constraint that caused households to overinvest labour in agricultural activities.

While both transfers appeared to raise off-farm labour participation, there is reason to be cautious in interpreting this finding. Labour outcomes carry more potential threats to the parallel trend assumption. If seasonal demand for labour differs in occupations more likely to be filled by beneficiaries, the positive transfer effects in the ADD estimations may simply reflect a differential

[18] Matching results suggest that the increase among cash beneficiaries lagged the food group for both outcomes (table A7).

change in labour market conditions for beneficiaries. In addition, the timing of the baseline survey, which occurred prior to the beginning of the school year among many beneficiaries, but after the beginning of the school year among some non-beneficiaries, raises similar cautions.[19] The estimates therefore cannot distinguish between the impact of the transfer and the fact that the opportunity cost of child labour increased at a higher rate among beneficiaries between survey rounds.

VI. Discussion and Conclusion

Two related issues have risen to prominence in the development literature: the emergence of non-food transfers, especially cash, as a means to increase food security and the potential long-term productive impacts of transfers to the poor. The current study examines both elements in the context of an emergency safety net transfer programme implemented by WFP in Yemen.

Beneficiaries who received food transfers adopted cash-crops, particularly kat, at a higher rate relative to their non-beneficiary neighbours. No such pattern occurred among cash recipients. However, relative to both food beneficiaries and non-recipients, cash recipients had slightly more livestock and were more likely to make changes in their irrigation systems. Both transfers appeared to raise the number of farm tools owned by a modest amount and both the extensive and intensive margins of off-farm labour participation.

The differences between the productive effects of food and cash transfers are consistent with theoretical models of agricultural households facing risk and liquidity constraints to investment. Food transfers act as insurance against food price volatility and thus encourage non-food production. Cash transfers provide liquidity to make purchases of productive assets such as livestock.

While the scope of the productive impacts of transfers are modest, the magnitude of some effects is non-trivial in comparison with the transfer size. The cash transfers, valued at a total of nearly US$150, increased livestock values by US$61, which is slightly more than the median price of a small ruminant. The fact that approximately 40 per cent of the transfer value remained with the household after the end of an emergency safety net programme in a crisis setting should serve to refute the notion that transfer impacts are completely ephemeral. While data limitations prevent

[19] Because of an unexpected delay in the acquisition of sampling lists for group C, the baseline survey was delayed among these households by one to two weeks. Over this short period, however, the academic year began at schools.

us from calculating the value of the added cash-crop production by food beneficiaries, the food transfers similarly appear to provide some measure of sustained non-consumed benefit in the form of future dividends from perennial kat production, albeit among a small share of the sample. Nonetheless, as in previous papers, we find no evidence that the transfer programme dramatically altered the productive potential of recipient households.

We cannot necessarily interpret the significantly larger livestock holdings of the cash group as direct evidence of higher productive investment. Economists have long noted that, in the absence of formal financial institutions, livestock investments commonly function as a low-risk savings instrument, rather than as an investment with an expected positive return (Anagol, Etang, and Karlan, 2017; Pica-Ciamarra et al., 2011). Formal banking is rare in rural Yemen, and cash recipients may plausibly have used the livestock market as a means of savings (Sawada and Zhang, 2012).

How should practitioners in the humanitarian sector view these results? A primary contribution of this paper is the highlight on the role of expectations in the productive potential of assistance, especially in crisis settings. In these settings, present needs are often combined with substantial future uncertainty. Investment decisions are predicated not merely on expectations about individual shocks, but also on market conditions more broadly. Combined with a more volatile environment, the productive potential of humanitarian transfers is likely to depend strongly on context, even relative to social safety nets in non-crisis settings.

The modest size of the effects measured here, as well as the modality sensitivity, underlines the difficulty of assessing the productive benefits of humanitarian interventions, at least in the short term. At the same time, the evidence indicates that, at least in some cases, recipients adjust the risk profile of their asset holdings and production activities. This suggests humanitarian transfers cannot be dismissed as completely orthogonal to development objectives.

A secondary contribution is the emphasis on the importance of considering a counterfactual other than the complete absence of assistance in evaluating transfer programmes, particularly in crisis settings where help is clearly needed. While some have criticized pure control groups in randomized controlled trials in development settings on ethical grounds, the concern here is related to a point raised by cash transfer advocates concerning the usefulness of benchmarking (Blattman and Niehaus, 2014). The pure control is a low bar in such humanitarian interventions, where the marginal benefit of assistance should be high. Evaluations of single treatments, even cash, can be difficult to interpret in these settings without a benchmark, particularly as they relate to long-term outcomes.

Some important limitations prevent a more definitive conclusion regarding the relative and absolute productive impacts of the transfer programmes. Because of the short duration of the transfer, our final round of data collection occurred before harvest. Therefore, we are unable to measure effects on actual measures of agricultural production, such as revenue, yield, or profit. We are also constrained in our ability reliably to measure effects on child outcomes, such as time use, labour and education. The difficulty stems from the timing of the baseline survey, which occurred prior to the beginning of the school year for much of the beneficiary sample. Therefore, we are unable to disentangle the seasonal and transfer impacts of changes in child time use.

Other caveats apply, as well. Our estimates rely heavily on the assumption of equivalent changes between baseline and endline among non-beneficiaries. The short period of time (seven months) that elapsed between surveys increases confidence in the parallel trends assumption, but differing time trends cannot be ruled out altogether. In addition, if non-beneficiaries have positive (negative) spillovers from the transfers, the effects estimated here may be under- (over)estimated. We also cannot dismiss the possibility that differences in the timing of the transfers by modality may play a role in driving the differences in outcomes by treatment arm.

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Table 1: Balance and Summary Statistics

	Beneficiary				**Non-Beneficiary**				**T-test**			
	(1)		(2)		(3)		(4)					
	Food		*Cash*		*Food*		*Cash*		(1)-(2)	(1)-(3)	(2)-(4)	(3)-(4)
Variable	N/ [FDPs]	Mean/SE	N/ [FDPs]	Mean/SE	N/ [FDPs]	Mean/SE	N/ [FDPs]	Mean/SE	Difference			
Grows any crops	617	1.00	537	0.99	379	0.99	363	0.98	0.01	0.01	0.01	0.01
	[66]	[0.00]	[67]	[0.00]	[63]	[0.01]	[59]	[0.01]				
Grows a cash-crop	617	0.21	537	0.26	379	0.24	363	0.29	−0.06	−0.03	−0.03	−0.05
	[66]	[0.04]	[67]	[0.03]	[63]	[0.04]	[59]	[0.04]				
Grows kat	617	0.16	537	0.25	379	0.19	363	0.27	−0.09*	−0.03	−0.02	−0.07
	[66]	[0.03]	[67]	[0.03]	[63]	[0.04]	[59]	[0.04]				
Grows wheat	617	0.05	537	0.06	379	0.04	363	0.04	−0.00	0.01	0.01	0.00
	[66]	[0.02]	[67]	[0.02]	[63]	[0.03]	[59]	[0.02]				
Grows only sorghum	614	0.83	531	0.81	375	0.79	355	0.77	0.01	0.04	0.04	0.01
	[66]	[0.03]	[67]	[0.02]	[63]	[0.03]	[59]	[0.03]				
Cattle	1000	0.47	980	0.47	682	0.39	688	0.44	0.00	0.08**	0.03	−0.05
	[67]	[0.04]	[67]	[0.04]	[66]	[0.04]	[66]	[0.04]				
Sheep and goats	1000	2.44	980	2.22	682	1.65	688	1.72	0.22	0.79***	0.50*	−0.06
	[67]	[0.25]	[67]	[0.25]	[66]	[0.17]	[66]	[0.28]				
Camels and donkeys	1000	0.42	980	0.45	682	0.37	688	0.45	−0.03	0.05	−0.01	−0.08
	[67]	[0.03]	[67]	[0.04]	[66]	[0.04]	[66]	[0.05]				
Poultry	1000	0.67	980	0.69	682	0.34	688	0.73	−0.02	0.33***	−0.04	−0.39**
	[67]	[0.10]	[67]	[0.13]	[66]	[0.07]	[66]	[0.16]				
Beehives	1000	0.10	980	0.05	682	0.02	688	0.01	0.04	0.08*	0.04	0.01
	[67]	[0.04]	[67]	[0.03]	[66]	[0.01]	[66]	[0.01]				
Tropical livestock units	1000	0.89	980	0.88	682	0.72	688	0.81	0.01	0.18***	0.07	−0.10
	[67]	[0.06]	[67]	[0.06]	[66]	[0.06]	[66]	[0.07]				
Total livestock value	1000	341.20	980	335.20	682	291.91	688	313.31	6.00	49.29*	21.89	−21.40
	[67]	[25.27]	[67]	[23.78]	[66]	[27.02]	[66]	[30.92]				
Ag expenditure	1000	2.73	980	1.23	682	0.78	688	0.65	1.50	1.95**	0.58	0.13
	[67]	[0.88]	[67]	[0.41]	[66]	[0.38]	[66]	[0.31]				
Total value of agricultural assets	1000	16.19	980	12.94	682	32.93	688	15.61	3.26*	−16.73	−2.67	17.32
	[67]	[1.23]	[67]	[1.10]	[66]	[20.67]	[66]	[3.85]				
Anyone in household worked for a wage	1000	0.42	980	0.44	682	0.50	688	0.46	−0.02	−0.08***	−0.02	0.04
	[67]	[0.02]	[67]	[0.02]	[66]	[0.02]	[66]	[0.03]				
Anyone in household worked in a business	1000	0.17	980	0.18	682	0.13	688	0.18	−0.01	0.03**	0.00	−0.05
	[67]	[0.02]	[67]	[0.02]	[66]	[0.02]	[66]	[0.03]				
Number earning wage (primary)	1000	0.55	980	0.60	682	0.68	688	0.65	−0.05	−0.12**	−0.06	0.02

	[67]	[0.04]	[67]	[0.04]	[66]	[0.04]	[66]	[0.05]				
Number in business (primary)	1000	0.20	980	0.24	682	0.16	688	0.21	−0.04	0.04	0.04	−0.05
	[67]	[0.03]	[67]	[0.04]	[66]	[0.03]	[66]	[0.04]				
Hours worked off-farm per worker	1000	4.40	980	4.85	682	6.38	688	6.60	−0.45	−1.98***	−1.75***	−0.22
	[67]	[0.27]	[67]	[0.29]	[66]	[0.38]	[66]	[0.45]				
Any child worked	1000	0.23	980	0.21	682	0.12	688	0.14	0.02	0.11***	0.07***	−0.02
	[67]	[0.01]	[67]	[0.02]	[66]	[0.02]	[66]	[0.02]				
Woman-headed household	1000	0.08	980	0.06	682	0.12	688	0.15	0.01	−0.04***	−0.09***	−0.03
	[67]	[0.01]	[67]	[0.01]	[66]	[0.01]	[66]	[0.02]				
Household head attended primary and up	1000	0.27	980	0.25	682	0.34	688	0.36	0.02	−0.08***	−0.11***	−0.01
	[67]	[0.02]	[67]	[0.02]	[66]	[0.02]	[66]	[0.02]				
Household head is married	1000	0.77	980	0.82	682	0.70	688	0.71	−0.05*	0.07***	0.11***	−0.01
	[67]	[0.02]	[67]	[0.02]	[66]	[0.02]	[66]	[0.02]				
Household head's age	1000	47.59	980	47.04	682	47.49	688	46.17	0.55	0.10	0.88	1.33
	[67]	[0.61]	[67]	[0.60]	[66]	[0.78]	[66]	[0.74]				
Household size	1000	8.66	980	8.89	682	7.08	688	7.07	−0.24	1.58***	1.83***	0.01
	[67]	[0.12]	[67]	[0.14]	[66]	[0.16]	[66]	[0.15]				
Household members aged 0–5	1000	1.20	980	1.23	682	1.04	688	1.12	−0.03	0.17**	0.11*	−0.09
	[67]	[0.05]	[67]	[0.04]	[66]	[0.05]	[66]	[0.06]				
Household members aged 6–17	1000	3.88	980	4.00	682	2.62	688	2.63	−0.12	1.26***	1.37***	−0.00
	[67]	[0.07]	[67]	[0.08]	[66]	[0.10]	[66]	[0.07]				
Number of televisions	1000	0.29	980	0.27	682	0.29	688	0.25	0.02	0.01	0.02	0.03
	[67]	[0.04]	[67]	[0.04]	[66]	[0.04]	[66]	[0.04]				
Number of refrigerators	1000	0.07	980	0.07	682	0.06	688	0.08	0.01	0.02	−0.01	−0.02
	[67]	[0.02]	[67]	[0.01]	[66]	[0.02]	[66]	[0.02]				
Number of motor vehicles	1000	0.02	980	0.03	682	0.02	688	0.02	−0.00	0.00	0.00	−0.00
	[67]	[0.01]	[67]	[0.01]	[66]	[0.01]	[66]	[0.01]				
Standardized wealth index	1000	0.07	980	−0.02	682	0.00	688	−0.01	0.10	0.07	−0.01	0.01
	[67]	[0.10]	[67]	[0.08]	[66]	[0.11]	[66]	[0.09]				

Note: Food distribution points (FDPs) represent a cluster-level of randomization. T-tests include controls on the randomization stratum (governorate). Total livestock value and the value of agricultural assets are in US dollars. At baseline, US$1 = YER 214.
Standard errors in parenthesis are clustered at the FDP level. $^{*}p < .1$ $^{**}p < .05$ $^{***}p < .01$

Table 2: Impact of food and cash transfers on crop choice

	Grows any crops	Grows a cash-crop	Grows kat	Grows wheat	Grows only sorghum
RDiD	0.02	0.02	0.02	0.01	0.01
	(0.01)*	(0.01)*	(0.01)**	(0.01)**	(0.01)
N	2,360	2,360	2,360	2,360	2,290
Westfall-Young p-value	*0.106*	*0.106*	*0.068*	*0.106*	*0.340*
ADD: food	0.01	0.02	0.02	−0.00	−0.02
	(0.01)	(0.01)**	(0.01)**	(0.01)	(0.01)*
N	2,013	2,013	2,013	2,013	1,963
Westfall-Young p-value	*0.508*	*0.158*	*0.158*	*0.846*	*0.158*
ADD: cash	−0.01	−0.01	−0.01	−0.02	−0.02
	(0.01)*	(0.01)	(0.01)	(0.01)**	(0.01)
N	1,858	1,858	1,858	1,858	1,790
Westfall-Young p-value	*0.148*	*0.448*	*0.430*	*0.119*	*0.219*
DDD	0.02	0.03	0.03	0.01	−0.00
	(0.01)**	(0.02)*	(0.02)**	(0.01)	(0.02)
N	3,871	3,871	3,871	3,871	3,753
Westfall-Young p-value	*0.104*	*0.143*	*0.099*	*0.273*	*0.838*

Note: Westfall-Young p-values listed below observations: numbers calculated based on 1,200 replications. RDiD estimates control for governorate fixed effects. All other estimates control for subdistrict (uzla) fixed effects. All estimates restricted to those who own or operate land. Cash-crops include any non-cereals or pulses. Estimates for the sorghum only regressions are restricted to the sample that grows any crops. Control variables include household size and baseline values of the following: gender, education level and marital status of the household head, and a standardized asset index.
Standard errors in parenthesis are clustered at the FDP level. *p < .1 **p < .05 ***p < .01

Table 3: Impact of food and cash transfers on number of livestock

	Cattle	Sheep and goats	Camels and donkeys	Poultry	Beehives	Tropical livestock units
RDiD	−0.04	−0.61	−0.03	−0.24	−0.06	−0.12
	(0.04)	(0.31)**	(0.04)	(0.17)	(0.04)	(0.06)*
N	3,960	3,960	3,960	3,960	3,960	3,960
Westfall-Young p-value	*0.401*	*0.036*	*0.401*	*0.195*	*0.262*	*0.036*
ADD: food	−0.00	−0.23	0.03	−0.32	−0.09	−0.01
	(0.04)	(0.29)	(0.03)	(0.12)***	(0.04)**	(0.05)
N	3,364	3,364	3,364	3,364	3,364	3,364
Westfall-Young p-value	*0.958*	*0.535*	*0.449*	*0.018*	*0.061*	*0.958*
ADD: cash	0.05	0.30	0.08	0.30	−0.02	0.13
	(0.04)	(0.21)	(0.04)**	(0.15)*	(0.04)	(0.06)**
N	3,336	3,336	3,336	3,336	3,336	3,336
Westfall-Young p-value	*0.223*	*0.205*	*0.023*	*0.037*	*0.406*	*0.023*
DDD	−0.05	−0.53	−0.05	−0.62	−0.07	−0.13
	(0.05)	(0.36)	(0.05)	(0.19)***	(0.05)	(0.08)*
N	6,700	6,700	6,700	6,700	6,700	6,700
Westfall-Young p-value	*0.326*	*0.183*	*0.326*	*0.000*	*0.315*	*0.093*

Note: Westfall-Young p-values listed below observations: numbers calculated based on 1,200 replications. RDiD estimates control for governorate fixed effects. All other estimates control for subdistrict (uzla) fixed effects. Dependent variables in all columns, except for final column, are the number of animals. Control variables include household size and baseline values of the following: gender, education level and marital status of the household head, and a standardized asset index.
Standard errors in parenthesis are clustered at the FDP level. *p < .1 **p < .05 ***p < .01

Table 4: Impact of food and cash transfers on value of livestock

	Cattle value	Sheep and goat value	Camel and donkey value	Poultry value	Total livestock value
RDiD	–17.25	–26.95	–7.38	–0.89	–57.74
	(22.33)	(16.17)*	(6.44)	(0.66)	(32.38)*
N	3,960	3,960	3,960	3,960	3,960
Westfall-Young p-value	*0.304*	*0.071*	*0.254*	*0.176*	*0.058*
ADD: food	28.87	–17.22	1.12	–0.86	6.19
	(23.83)	(13.94)	(5.74)	(0.60)	(32.43)
N	3,364	3,364	3,364	3,364	3,364
Westfall-Young p-value	*0.288*	*0.288*	*0.957*	*0.196*	*0.957*
ADD: cash	35.55	16.39	8.13	0.73	61.04
	(22.28)	(14.50)	(6.71)	(0.54)	(31.50)*
N	3,336	3,336	3,336	3,336	3,336
Westfall-Young p-value	*0.103*	*0.187*	*0.187*	*0.154*	*0.032*
DDD	–5.98	–33.41	–6.95	–1.59	–53.88
	(32.42)	(20.03)*	(8.82)	(0.80)**	(45.05)
N	6,700	6,700	6,700	6,700	6,700
Westfall-Young p-value	*0.762*	*0.079*	*0.508*	*0.027*	*0.237*

Note: Westfall-Young p-values listed below observations: numbers calculated based on 1,200 replications. RDiD estimates control for governorate fixed effects. All other estimates control for subdistrict (uzla) fixed effects. Values in US dollars are self-reported replacement values. Control variables include household size and baseline values of the following: gender, education level and marital status of the household head, and a standardized asset index.
Standard errors in parenthesis are clustered at the FDP level. *p $<$ .1 **p $<$ .05 ***p $<$ .01

Table 5: Impact of food and cash transfers on agricultural assets

	Ploughs	Small farm tools (e.g. hoes)	Large farm tools (e.g. pump, cart)	Hand mills	Knapsack sprayer	Tractors	Total value of agricultural assets
RDiD	–0.05	–0.07	–0.04	0.01	–0.01	–0.00	–9.17
	(0.03)	(0.14)	(0.02)**	(0.03)	(0.01)	(0.00)	(30.92)
N	3,960	3,960	3,960	3,960	3,960	3,960	3,960
Westfall-Young p-value	*0.288*	*0.960*	*0.178*	*0.960*	*0.960*	*0.960*	*0.960*
ADD: food	–0.00	0.30	–0.01	0.04	0.01	–0.00	1.64
	(0.04)	(0.12)**	(0.02)	(0.03)	(0.02)	(0.00)	(2.68)
N	3,364	3,364	3,364	3,364	3,364	3,364	3,364
Westfall-Young p-value	*0.978*	*0.106*	*0.964*	*0.418*	*0.823*	*0.418*	*0.964*
ADD: cash	0.04	0.36	0.06	–0.03	0.01	0.00	12.67
	(0.03)	(0.13)***	(0.03)*	(0.03)	(0.01)	(0.00)	(30.76)
N	3,336	3,336	3,336	3,336	3,336	3,336	3,336
	0.408	*0.113*	*0.223*	*0.353*	*0.792*	*0.975*	*0.881*
DDD	–0.04	–0.06	–0.07	0.07	0.01	–0.00	–10.73
	(0.05)	(0.18)	(0.04)*	(0.04)*	(0.02)	(0.00)	(30.80)
N	6,700	6,700	6,700	6,700	6,700	6,700	6,700
Westfall-Young p-value	*0.797*	*0.956*	*0.158*	*0.128*	*0.956*	*0.797*	*0.956*

Note: Westfall-Young p-values listed below observations: numbers calculated based on 1,200 replications. RDiD estimates control for governorate fixed effects. All other estimates control for subdistrict (uzla) fixed effects. In columns 1–6, the dependent variable is number of items. Value of agricultural assets is self-reported replacement value and given in US dollars. Control variables include household size and baseline values of the following: gender, education level and marital status of the household head, and a standardized asset index.
Standard errors in parenthesis are clustered at the FDP level. *p < .1 **p < .05 ***p < .01

Table 6: Impact of food and cash transfers on investment

	Ag expenditure	Any ag expenditure	Any debt expenditure	Debt expenditure
RDiD	–1.53	–0.03	–0.05	–4.76
	(1.00)	(0.01)**	(0.02)**	(3.51)
N	3,960	3,960	3,959	3,959
Westfall-Young p-value	*0.072*	*0.020*	*0.017*	*0.072*
ADD: food	–1.85	–0.03	0.00	–3.10
	(0.96)*	(0.01)*	(0.02)	(3.39)
N	3,364	3,364	3,364	3,364
Westfall-Young p-value	*0.036*	*0.036*	*0.762*	*0.326*
ADD: cash	–0.51	–0.02	0.03	0.03
	(0.52)	(0.01)*	(0.02)	(2.46)
N	3,336	3,336	3,335	3,335
Westfall-Young p-value	*0.315*	*0.052*	*0.156*	*0.991*
DDD	–1.34	–0.01	–0.02	–3.11
	(1.08)	(0.02)	(0.03)	(4.17)
N	6,700	6,700	6,699	6,699
Westfall-Young p-value	*0.226*	*0.543*	*0.543*	*0.543*

Note: Westfall-Young p-values listed below observations: numbers calculated based on 1,200 replications. RDiD estimates control for governorate fixed effects. All other estimates control for subdistrict (uzla) fixed effects. Expenditures in US dollars. Agricultural expenditure includes equipment, inputs, and veterinary services, but excludes labour and livestock purchases. Control variables include household size and baseline values of the following: gender, education level and marital status of the household head, and a standardized asset index.
Standard errors in parenthesis are clustered at the FDP level. *p $<$ .1 **p $<$ .05 ***p $<$ .01

Table 7: Impact of food and cash transfers on investment in land

	Investment in any plot between rounds	Changed irrigation system	Change in size of plot (sq meters)
SD	0.01	−0.01	−1.22
	(0.03)	(0.01)	(0.72)*
N	1,203	1,124	1,122
Westfall-Young p-value	*.572*	*.523*	*.217*
EDD	0.02	−0.03	−0.01
	(0.04)	(0.01)**	(0.68)
N	1,968	1,848	1,844
Westfall-Young p-value	*.774*	*.008*	*.997*

Note: Westfall-Young p-values listed below observations: numbers calculated based on 1,200 replications. Dependent variables are taken in endline only and represent reported changes between baseline and endline. The SD estimates reflect single difference specifications that measure the relative impact of food to cash for beneficiaries only. The endline double difference (EDD) estimates difference out the non-beneficiaries within each subdistrict. Control variables include household size and baseline values of the following: gender, education level and marital status of the household head, and a standardized asset index.
Standard errors in parenthesis are clustered at the FDP level. *p < .1 **p < .05 ***p < .01

Table 8: Impact of food and cash transfers on labour

	Anyone in household worked for a wage	Anyone in household worked in a household business	Number earning wage (primary)	Number in business (primary)	Hours worked off-farm per worker	Any child worked
RDiD	−0.01	−0.01	0.01	0.01	0.15	−0.03
	(0.04)	(0.03)	(0.06)	(0.05)	(0.43)	(0.02)
N	3,960	3,960	3,960	3,960	3,960	3,960
Westfall-Young p-value	*0.978*	*0.976*	*0.978*	*0.978*	*0.976*	*0.274*
ADD: Food	0.13	−0.06	0.26	−0.06	1.46	−0.04
	(0.04)***	(0.03)**	(0.06)***	(0.05)	(0.48)***	(0.02)*
N	3,364	3,364	3,364	3,364	3,364	3,364
Westfall-Young p-value	*0.000*	*0.001*	*0.000*	*0.053*	*0.000*	*0.017*
ADD: Cash	0.06	0.00	0.15	0.00	1.24	−0.03
	(0.03)**	(0.03)	(0.07)**	(0.05)	(0.44)***	(0.02)
N	3,336	3,336	3,336	3,336	3,336	3,336
Westfall-Young p-value	*0.009*	*0.951*	*0.008*	*0.951*	*0.000*	*0.232*
DDD	0.06	−0.07	0.11	−0.06	0.22	−0.01
	(0.05)	(0.04)	(0.09)	(0.07)	(0.65)	(0.03)
N	6,700	6,700	6,700	6,700	6,700	6,700
Westfall-Young p-value	*0.237*	*0.132*	*0.267*	*0.489*	*0.872*	*0.872*

Note: Westfall-Young p-values listed below observations: numbers calculated based on 1,200 replications. RDiD estimates control for governorate fixed effects. All other estimates control for subdistrict (uzla) fixed effects. Business activity excludes on-farm work. Columns 3 and 4 count only those who report their primary job as wage earning or business. Child is defined as any household member under the age of 14. Control variables include household size and baseline values of the following: gender, education level and marital status of the household head, and a standardized asset index.
Standard errors in parenthesis are clustered at the FDP level. *p < .1 **p < .05 ***p < .01

Annex: Results from kernel weighted matching regressions

Table A.1: Impact of food and cash transfers on crop choice

	Grows any crops	Grows a cash-crop	Grows kat	Grows wheat	Grows only sorghum
ADD: food	−0.00	0.02	0.02	0.00	−0.02
	(0.01)	(0.01)*	(0.01)**	(0.00)	(0.01)**
N	1,961	1,961	1,961	1,961	1,912
ADD: cash	−0.02	−0.03	−0.03	−0.01	−0.01
	(0.01)**	(0.02)*	(0.01)**	(0.01)**	(0.01)
N	1,804	1,804	1,804	1,804	1,739
DDD	0.02	0.05	0.05	0.02	−0.01
	(0.01)*	(0.02)**	(0.02)***	(0.01)**	(0.02)
N	3,765	3,765	3,765	3,765	3,651

Note: All estimates control for uzla fixed effects. All estimates restricted to those who own or operate land. Cash-crops include any non-cereals or pulses. Estimates for the sorghum only regressions are restricted to the sample that grows any crops. Estimates obtained using regression adjustment weighted by kernel matches on the propensity score. Matching algorithm uses a bandwidth of .004 and a tricube kernel. Propensity score estimated using a logit model. Matching variables are household size, numbers of children attending or not attending school, housing characteristics (floor material, water source), household head characteristics (gender, literacy, marital status), asset ownership (televisions, phones, sewing machine), and governorate. Standard errors in parenthesis are clustered at the FDP level. *p $<$ .1 **p $<$ .05 ***p $<$ .01

Table A.2: Impact of food and cash transfers on number of livestock

	Cattle	Sheep and goats	Camels and donkeys	Poultry	Beehives	Tropical livestock units
ADD: food	−0.02	−0.20	0.02	−0.43	−0.08	−0.02
	(0.04)	(0.31)	(0.05)	(0.13)***	(0.03)**	(0.06)
N	3,332	3,332	3,332	3,332	3,332	3,332
ADD: cash	0.02	0.30	0.09	0.24	−0.06	0.11
	(0.06)	(0.24)	(0.05)*	(0.17)	(0.05)	(0.08)
N	3,290	3,290	3,290	3,290	3,290	3,290
DDD	−0.04	−0.50	−0.07	−0.67	−0.01	−0.14
	(0.07)	(0.40)	(0.07)	(0.21)***	(0.06)	(0.10)
N	6,622	6,622	6,622	6,622	6,622	6,622

Note: All estimates control for uzla fixed effects. Dependent variables in all columns, except for final column, are the number of animals. Estimates obtained using regression adjustment weighted by kernel matches on the propensity score. Matching algorithm uses a bandwidth of .004 and a tricube kernel. Propensity score estimated using a logit model. Matching variables are household size, numbers of children attending or not attending school, housing characteristics (floor material, water source), household head characteristics (gender, literacy, marital status), asset ownership (televisions, phones, sewing machine), and governorate.
Standard errors in parenthesis are clustered at the FDP level. *p $<$ .1 **p $<$ .05 ***p $<$ .01

Table A.3: Impact of food and cash transfers on value of livestock

	Cattle value	Sheep and goat value	Camel and donkey value	Poultry value	Total livestock value
ADD: food	28.29	−16.35	−1.53	−1.53	2.98
	(23.59)	(15.47)	(12.53)	(0.58)***	(36.58)
N	3,332	3,332	3,332	3,332	3,332
ADD: cash	8.03	14.72	6.37	0.43	27.92
	(36.45)	(16.88)	(6.67)	(0.57)	(50.50)
N	3,290	3,290	3,290	3,290	3,290
DDD	20.20	−31.09	−7.92	−1.96	−25.03
	(43.38)	(22.87)	(14.17)	(0.81)**	(62.31)
N	6,622	6,622	6,622	6,622	6,622

Note: All estimates control for uzla fixed effects. Values in US dollars are self-reported replacement values. Estimates obtained using regression adjustment weighted by kernel matches on the propensity score. Matching algorithm uses a bandwidth of .004 and a tricube kernel. Propensity score estimated using a logit model. Matching variables are household size, numbers of children attending or not attending school, housing characteristics (floor material, water source), household head characteristics (gender, literacy, marital status), asset ownership (televisions, phones, sewing machine), and governorate.
Standard errors in parenthesis are clustered at the FDP level. *p < .1 **p < .05 ***p < .01

Table A.4: Impact of food and cash transfers on agricultural assets

	Ploughs	Small farm-tools (e.g. hoes)	Large farm-tools (e.g. pump, cart)	Hand mills	Knapsack sprayer	Tractors	Total value of agricultural assets
ADD: food	0.06	0.28	−0.01	0.03	0.01	−0.01	−59.56
	(0.06)	(0.17)*	(0.01)	(0.04)	(0.02)	(0.00)	(57.18)
N	3,332	3,332	3,332	3,332	3,332	3,332	3,332
ADD: cash	0.03	0.29	0.04	0.02	−0.01	−0.00	6.50
	(0.04)	(0.15)*	(0.02)**	(0.03)	(0.01)	(0.00)	(34.07)
N	3,290	3,290	3,290	3,290	3,290	3,290	3,290
DDD	0.03	−0.01	−0.05	0.01	0.02	−0.00	−66.09
	(0.07)	(0.23)	(0.02)**	(0.06)	(0.03)	(0.00)	(66.48)
N	6,622	6,622	6,622	6,622	6,622	6,622	6,622

Note: All estimates control for uzla fixed effects. In columns 1–6, the dependent variable is number of items. Value of agricultural assets is self-reported replacement value and given in US dollars. Estimates obtained using regression adjustment weighted by kernel matches on the propensity score. Matching algorithm uses a bandwidth of .004 and a tricube kernel. Propensity score estimated using a logit model. Matching variables are household size, numbers of children attending or not attending school, housing characteristics (floor material, water source), household head characteristics (gender, literacy, marital status), asset ownership (televisions, phones, sewing machine), and governorate.
Standard errors in parenthesis are clustered at the FDP level. *p < .1 **p < .05 ***p < .01

Table A.5: Impact of food and cash transfers on investment

	Ag expenditure	Any ag expenditure	Any debt expenditure	Debt expenditure
ADD: food	–1.74	–0.01	–0.02	–5.62
	(0.95)*	(0.02)	(0.02)	(3.78)
N	3,332	3,332	3,332	3,332
ADD: cash	–0.55	–0.01	0.04	2.88
	(0.48)	(0.01)	(0.02)*	(3.79)
N	3,290	3,290	3,289	3,289
DDD	–1.19	–0.00	–0.05	–8.49
	(1.06)	(0.02)	(0.03)*	(5.35)
N	6,622	6,622	6,621	6,621

Note: All estimates control for uzla fixed effects. Expenditures in US dollars. Agricultural expenditure includes equipment, inputs, and veterinary services, but excludes labour and livestock purchases. Estimates obtained using regression adjustment weighted by kernel matches on the propensity score. Matching algorithm uses a bandwidth of .004 and a tricube kernel. Propensity score estimated using a logit model. Matching variables are household size, numbers of children attending or not attending school, housing characteristics (floor material, water source), household head characteristics (gender, literacy, marital status), asset ownership (televisions, phones, sewing machine), and governorate.
Standard errors in parenthesis are clustered at the FDP level. *p < .1 **p < .05 ***p < .01

Table A.6: Impact of food and cash transfers on land investment

	Investment in any plot between rounds	Changed irrigation system	Change in size of plot (sq meters)
EDD	0.01	–0.01	–1.22
	(0.03)	(0.01)	(0.72)*
N	1,203	1,124	1,122

Note: Dependent variables are taken in endline only and represent reported changes between baseline and endline. The endline double difference (EDD) estimates difference out the non-beneficiaries within each subdistrict. Matching algorithm uses a bandwidth of .004 and a tricube kernel. Propensity score estimated using a logit model. Matching variables are household size, numbers of children attending or not attending school, housing characteristics (floor material, water source), household head characteristics (gender, literacy, marital status), asset ownership (televisions, phones, sewing machine), and governorate.
Standard errors in parenthesis are clustered at the FDP level. *p < .1 **p < .05 ***p < .01

Table A.7: Impact of food and cash transfers on labour

	Anyone in household worked for a wage	Anyone in household worked in a household business	Number earning wage (primary)	Number in business (primary)	Hours worked off-farm per worker	Any child worked
ADD: food	0.16	−0.09	0.31	−0.10	1.26	0.03
	(0.04)***	(0.03)**	(0.08)***	(0.05)**	(0.50)**	(0.03)
N	3,332	3,332	3,332	3,332	3,332	3,332
ADD: cash	0.03	−0.01	0.07	−0.02	0.69	0.04
	(0.04)	(0.04)	(0.10)	(0.06)	(0.54)	(0.03)
N	3,290	3,290	3,290	3,290	3,290	3,290
DDD	0.12	−0.07	0.24	−0.09	0.58	−0.00
	(0.06)**	(0.05)	(0.13)*	(0.08)	(0.73)	(0.04)
N	6,622	6,622	6,622	6,622	6,622	6,622

Note: All estimates control for uzla fixed effects. Business activity excludes on-farm work. Columns 3 and 4 count only those who report their primary job as wage earning or business. Child is defined as any household member under the age of 14. Estimates obtained using regression adjustment weighted by kernel matches on the propensity score. Matching algorithm uses a bandwidth of .004 and a tricube kernel. Propensity score estimated using a logit model. Matching variables are household size, numbers of children attending or not attending school, housing characteristics (floor material, water source), household head characteristics (gender, literacy, marital status), asset ownership (televisions, phones, sewing machine), and governorate. Standard errors in parenthesis are clustered at the FDP level. *p $<$ .1 **p $<$ .05 ***p $<$ .01