Much ado about modalities: Multicountry experiments on the effects of cash and food transfers on consumption patterns[†]

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Abstract:
Aid agencies often provide transfers in food rather than cash out of a paternalistic belief that food transfers will better improve household food security. However, evidence from Latin America shows that cash transfers often increase the share of food in consumption, counter to Engel's Law. This finding suggests households treat transfer income differently, with previous literature arguing that transfers shift intrahousehold bargaining. Until now, there has been little rigorous evidence on how the effects of transfers on food consumption patterns differ by context or by transfer modality. We use experimental data from three countries, Ecuador, Uganda and Yemen, to test the relative impact of food transfers and cash transfers (and vouchers in Ecuador) on the food share of consumption, food Engel curves, and the composition of food consumption. We find that, in all three countries, there are no significant differences by modality in the impacts of transfers on overall food share or food Engel curves. In particular, in Ecuador, transfers in the form of food, cash, or vouchers all increase the share of food in total consumption, representing outward shifts of the food Engel curves, but there are no significant differences by modality in these shifts. In Uganda, neither food nor cash significantly changes the food share of consumption. In Yemen, there is also no significant difference in Engel curves between food and cash beneficiaries. However, we find in all three countries that there are differences by modality in impacts on the *composition* of food consumption. In two of the three countries, food transfers lead to increased food group shares of the items included in the food ration, and in all three countries, cash transfers lead to larger improvements in dietary diversity. We find no evidence of changes in intrahousehold bargaining power due to any transfer modality in all three countries, suggesting another factor may be responsible for shifting Engel curves in Ecuador.

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I. Introduction

Social protection programs that provide periodic transfers to poor households to improve household welfare have become common in developing countries over the last 15 years. The growth in popularity of these programs appears to be well justified, as there is a substantial body of rigorous evidence that such programs can have large beneficial effects on household food security, poverty, education and, in some cases, child nutrition (Baird, Ferreira, & Woolcock, 2013; Fiszbein et al., 2009). During the emergence of these programs, a vigorous debate developed among policymakers, donors and researchers about the relative merits of different transfer modalities. In-kind transfers, particularly in the form of food aid, have been a common form of social assistance and emergency relief for decades. However, as transfer programs became common as a perpetual social safety net, cash was the preferred transfer modality. More recently, some programs have used food vouchers as an alternative transfer modality that shares some of the features of both food and cash transfers.

In theory, cash is preferable to in-kind transfers on welfare grounds: cash provides recipients with the freedom of choice to make optimal expenditure decisions. It does not distort individual consumption or production choices at the margin, and providing cash generally has lower administrative costs. Cash recipients also do not face transaction costs from converting an in-kind transfer to the desired composition of consumption, but they may face substantial costs to reach markets for purchases. On the other hand, transfers of food can be self-targeting, as only poor households will seek access to the transfers. When the objective of the transfer program is to increase household food consumption, a common rationale for providing transfers in the form of a food ration is that it is more likely to be consumed as food. This may not be the case if the foods provided are *inframarginal*, meaning that they provide less food of that type than the family typically consumes in the relevant period. In that case, the household would simply reduce their own purchases of food (or sell more of their harvest) and use the additional resources to increase consumption of other goods. If transfers are *extramarginal*, or more than the household typically consumes, then it is possible to increase consumption of the provided good.

However, there are several reasons why food transfers may lead to a 'stickiness' in food consumption, in the form of an increase in the share of consumption going to food, even when food transfers are inframarginal. One reason is that households may face transaction costs of converting other household resources to the desired consumption bundle, as in the case when most household income comes from the sale of crops. Also, food transfers may induce a 'labeling' effect in which households infer from the form of the modality that they should consume a higher share of consumption from the transfer as food. Also, women often have more control over food purchases and preparation. Evidence that resources controlled by women lead to better child outcomes further motivates the use of food as transfer modality among policymakers seeking improvements in child outcomes. Proponents of cash transfers argue that in-kind transfers are motivated by a form of paternalism that is unjustified by the evidence. For

example, there is scant evidence to support claims that cash transfers are disproportionately used for expenditures on vices such as alcohol or tobacco. Vouchers may have similar effects as food, but vouchers can offer more flexibility in terms of the kinds of products that can be made available, with lower cost of delivery than food.

Despite the intensity of the debate over food assistance modalities, there is limited evidence on the relative impact of different transfer modalities on consumption patterns. Currie and Gahvari (2008) provide an excellent overview of common motivations for in-kind programs and present evidence on the incidence of such programs across countries in the areas of health, housing, child care, education and active labor market programs, but they do not provide evidence on the relative effects of transfer modality on patterns of food consumption. In a randomized trial comparing cash and food assistance in Mexico, Cunha (2014) finds similar impacts on overall food consumption among recipients of either modality; however, he finds large discrepancies by modality in the composition of consumption which implies extramarginality at the food item level. In a separate study of the same program in Mexico, Cunha, De Giorgi and Jayachandran (2011) show that food transfers lead to lower local prices than cash transfers because food transfers increase both supply and demand whereas cash transfers only increase demand. In analysis of a program in Democratic Republic of Congo, Aker (2013) finds that an inframarginal food voucher leads to higher food consumption than cash transfers, but concludes that cash transfers are a more efficient delivery mechanism.

Two recent papers present evidence that is much closer to the purpose of this paper. Both papers address applications of Engel's Law that the share of food in total consumption declines as income rises. Engel's Law has substantial empirical support and is often demonstrated by a graph of the share of food in total consumption on the y-axis and the log of total consumption on the x-axis. Using quasi-experimental methods, Attanasio, Battistin and Mesnard (2012) show that, although food Engel curves slope downward, income from Columbia's conditional cash transfer program leads to an increase in the food share of consumption. This implies that the program is not simply moving households along the Engel curve, but that the program causes the Engel curve to shift out. They attribute this shift to the program's impact on improving the bargaining power of women within the household. Angelucci and Attanasio (2013) provide similar evidence for *Oportunidades*, the conditional cash transfer program in Mexico, using quasi-experimental data. They find that the program's transfers shift out the food Engel curve and increase food shares, and conclude that this is the result of providing transfers to women in the household.

Among the gaps in the current literature, few studies have addressed the relative impact of food and cash transfers by directly comparing the transfer modalities side-by-side in the same setting; there is little evidence comparing the effect of food and cash transfers on food consumption patterns; few studies have undertaken such comparisons using rigorous, randomized designs; and no studies have evidence of the relative effects of transfer modalities across multiple countries. This study addresses all of these concerns using data collected from a

multicountry experiment conducted in conjunction with the World Food Program. In particular, we investigate the relative impact of food and cash transfers on food consumption patterns in Ecuador, Uganda, and Yemen. Having evidence from three countries makes a substantial contribution to the external validity of the findings.

In all three countries, communities were randomly assigned to receive equal valued transfers of either cash or food (or food voucher in the case of Ecuador). In Ecuador and Uganda, a randomized control group was also included which allows us to assess overall impact in addition to relative impacts. For all three countries, we present Engel curves of the share of food in total consumption against log total consumption and examine differences in the patterns of the Engel curves across intervention arms. We also present food group Engel curves of the share of each food group in food consumption against log total food consumption, again comparing differences in patterns across intervention arms. Next, we present estimates of the average impacts of the transfer programs on food consumption, total consumption, the food share of consumption and food group shares, testing for differences in impacts by transfer modality. Lastly, we test whether these estimates differ for female-headed households, as a direct test of whether gender-based differences in preferences and related intrahousehold bargaining may explain some of our results.

We find substantial variability in the effect of the transfers. Although the transfers are inframarginal with respect to food consumption in all three countries, transfers in the form of food, cash or vouchers in Ecuador lead to an increase in the share of food in total consumption, shifting out the food Engel curves. In Uganda, where food Engel curves are upward sloping, cash transfers (not food) increase food and total consumption but do not significantly increase the food share of consumption. In Yemen, there is no significant difference in Engel curves between food and cash beneficiaries. Despite this variability in effects, we find no evidence of differential effects of food and cash transfers on the food share of consumption. However, the differential effects with respect to specific food groups exists, and is consistent with cash leading to an improvement in the quality of diets as a result of the transfers in all three countries. We find no evidence for changes in intrahousehold bargaining power under any modality.

This paper proceeds as follows. Section II presents the interventions in each country and the study design. Section III describes the data and Section IV presents the Engel curves. Section V presents treatment effects on consumption patterns by transfer modality. Section VI presents evidence about whether the programs effect intrahousehold bargaining. Section VII concludes.

II. Intervention and study design

In 2010, the World Food Programme (WFP) contracted the International Food Policy Research Institute (IFPRI) to conduct a multi-country study of the impact and cost-effectiveness of

different transfer modalities on household food security and other outcomes in Ecuador, Uganda, and Yemen. In this paper, we exploit data collected for these studies from 2010 to 2012 to study the effects of transfer modality on household food consumption patterns.[3] In all three countries, an experimental design was used in which cash transfers or food transfers were randomly assigned at a locality level. Randomized control groups were also included in the Ecuador and Uganda studies, and a food voucher treatment arm was included in Ecuador. Within each country, program implementers from WFP worked with the study team to make sure that the frequency and value of transfers were equalized as much as possible across modalities, so that differences in outcomes could be attributed to the modality and not to other confounding factors.[4] Although the objectives and randomized design were similar across countries, the target populations and size of transfers varied by country, as explained in more detail below and summarized in Table 1.

2.1.Ecuador

Responding to a request from the government of Ecuador in April 2011, WFP expanded its assistance to address the food security and nutrition needs of Colombian refugees and to support their integration into Ecuadorian communities.[5] The new program consisted of six monthly transfers of cash, food vouchers, or food to Colombian refugees and poor Ecuadorian households. In order to receive transfers, households had to attend monthly nutrition trainings aimed at influencing behavior change and increasing nutrition knowledge of recipient households. Although the program was targeted toward women, based on household demographics (for example, if there was no adult woman available), men could also be transfer recipients and participate in all program activities. Overall, approximately 79 percent of beneficiaries in Carchi province and 73 percent of beneficiaries in Sucumbíos province were women (WFP-Ecuador, 2011).

The program was implemented in seven urban centers in the provinces of Carchi and Sucumbíos. Neighborhoods[6] within these urban centers with large numbers of Colombian refugees and relatively high levels of poverty were pre-selected for the program. Households residing in the selected neighborhoods with low socioeconomic status as measured by a proxy means test were eligible to participate. Participating households received benefits from May to October 2011. The value of the monthly transfer was standardized across all treatment arms at US$40 per month per household, which is approximately 10% of households' pre-transfer

[3] A study comparing cash and food transfers was also conducted in Niger, but the Niger data are not included in this study because they do not include detailed household consumption and expenditure data.
[4] Differences in implementation of the transfer modalities across treatment arms within countries and potential effects on interpretation of findings are discussed in detail below.
[5] For more information on Ecuador's program, see (Hidrobo, Hoddinott, Peterman, Margolies, & Moreira, 2012, 2014)
[6] Neighborhoods are existing administrative units within the urban centers with oversight over social services and other administrative functions.

monthly consumption levels. For the cash treatment arm, the $40 was transferred monthly onto pre-programmed ATM cards which could be retrieved at any time after it had been transferred; however, it had to be taken out in bundles of $10. The food vouchers were also valued at $40 and given in denominations of $20, redeemable for a list of nutritionally-approved foods at central supermarkets in each urban center. The list of approved foods consisted of cereals, tubers, fruits, vegetables, legumes, meats, fish, milk products, and eggs. The food vouchers could be used over a series of two visits per month and had to be redeemed within 30 days of initial receipt of the voucher. The vouchers were serialized and printed centrally, and were non-transferable. The food transfer was valued according to regional market prices at $40 and included rice (24 kilograms), vegetable oil (4 liters), lentils (8 kilograms), and canned sardines (8 cans of 0.425 kilograms).

Random assignment of the different transfer modalities was conducted in two stages: first, pre-selected neighborhoods were randomized to either the treatment group or the control group; second, all treatment clusters (geographical units within neighborhoods) were randomized to cash, food voucher, or food transfer. Due to the distinct socioeconomic and geographic characteristics of Sucumbíos and Carchi, the randomization of cluster centers was stratified at the province level. In total 80 neighborhoods and 145 clusters were randomized into the four intervention arms – control, cash, vouchers and food. Hidrobo et al (2014) show that randomization was, for the most part, effective at balancing baseline characteristics across the four intervention arms.

2.2.Uganda

The Uganda case study takes place in Karamoja, a remote and poor sub-region in Eastern Uganda characterized by high malnutrition and limited markets. Since 2007, UNICEF has supported informal preschools, known as Early Childhood Development (ECD) centers, in Karamoja, with the aim of improving school readiness among children ages 3-5 years. In 2010, WFP began a collaboration with IFPRI and UNICEF to study the impact of food or cash transfers linked to children's enrollment in these ECD centers.[7] Through the study, 98 ECD centers across three districts of Karamoja (Napak, Kotido, and Kaabong) were randomly assigned to a food transfer arm, a cash transfer arm, or a control arm. Households were assigned to receive transfers if they had a child aged 3-5 years enrolled in an eligible ECD center. Six cycles of transfers were made at roughly 6-8 week intervals, from April 2011 – May 2012. Transfers were made preferentially to the child's mother (or female caregiver). Although both the child's mother and another responsible household member (usually the child's father) were listed on the ration card issued by WFP in case she was unavailable, about 80 percent of households reported that transfers were collected by the child's mother.

[7] For more details on the ECD centers and the transfer program, refer to Gilligan et al (2013) and Gilligan and Roy (2013).

The value of each transfer was standardized across the food and cash arms. Each food transfer was a 6-week ration with a daily 1200-calorie portion of 200g multiple-micronutrient-fortified corn soy blend (CSB+), 20g vitamin-A fortified oil, and 15g sugar. Each cash transfer was 25,500 UGX (about $10.25), calculated to be the cost of purchasing the food ration in local markets according to a market analysis. The cash was added electronically to a card similar to an ATM card and could then be redeemed at mobile money agents brought to villages in the study areas in order to dispense cash for the program.

It was intended that not only the value of transfers, but also the timing of transfer delivery, would be equalized across the food and cash arms. However, logistical challenges in setting up the new cash transfer scheme in Karamoja led to delays in the timing of cash disbursements, so that each cash cycle tended to be delivered several weeks later than the corresponding food cycle. At the time of the endline survey, cash beneficiaries had received their last transfer on average 40 days ago, while food beneficiaries had received their last transfer on average 57 days ago. Given that food transfers were designed to cover a period of 6 weeks (42 days), the difference in timing makes it possible that most food beneficiaries had run out of the transfer by the time of the endline survey interviews. This suggests that these food transfers may not be captured in recalls of food consumption during the past 7 days. Despite these differences in timing of delivery of transfers, the number of transfers received across the food and cash treatment arms was comparable (Gilligan, et al., 2013).

Randomized assignment of the two transfer modalities was conducted at the level of ECD centers, stratified by district (in the case of Napak and Kotido) or by subdistrict (in the case of the larger and more spatially-diverse Kaabong). In total, 35 ECD centers were assigned to food, 31 centers to cash, and 32 centers to control. Gilligan et al (2013) show that randomization was effective in balancing baseline characteristics across the three arms.

2.3.Yemen

Yemen consistently ranks near the bottom across a range of development indicators, including those related to nutrition, food security, gender, and human development. More recently, the emerging conflict and civil unrest have been thought to exacerbate the so called triple "F" (food, fuel, and financial) crisis, further impoverishing the Yemeni population (Breisinger et al. 2010). In late 2009, WFP carried out a Comprehensive Food Security Survey (CFSS) whose results showed that almost one in three Yemenis suffered from food insecurity (31.5 percent), more than 12 percent of which could be characterized as severely food insecure.

In response, WFP initiated an emergency safety net program consisting of bi-monthly cash and food transfers to assist 1.8 million "severely-food-insecure" persons across 14 governorates. Proxy means scores determined household eligibility. Household-level cash transfers were distributed at district branches of the Yemen Post and Postal Savings Corporation

(PPSC), and food transfers were delivered and distributed at school buildings in cooperation with the Ministry of Education (MoE).

The value of the bi-monthly transfer was standardized across treatment arms using a market price survey conducted in June 2011. The food ration was calculated to be equivalent to the estimated median residual caloric gap between the recommended individual caloric intake and the typical intake of food-insecure households (initially calculated at approximately 25 percent of the required caloric needs, or 500 kcal per person per day). The food basket consisted of two items estimated to cover the bi-monthly food ration gap for an average household size of seven persons: 50 kg of wheat flour and 5.0 liters of vegetable oil. The total value of the cash transfer was then set at approximately $49 (10,500 Yemeni riyals [YER]) per household every two months, a figure based on the equivalent price of the food ration at local markets. Cash transfer recipient households could collect cash at any time up to 25 days after the initiation of a disbursement round.

For the 2011-2012 Emergency Safety Net (ESN), 136 existing food distribution points (FDPs) in rural areas of Hajjah and Ibb governorates were randomly assigned into cash transfers or food transfer arms. Those eligible households residing in the FDP catchment area were provided three transfers on an approximate bi-monthly basis. Upon consultation with the WFP Yemen country office, it became apparent that a pure control group was not feasible in the context of the ESN due to ethical and security concerns of key stakeholders.

Changes in timing of the survey and distribution schedule resulted in the loss of a pure pre-intervention survey, as the baseline survey occurred after the distribution of the first food transfer (but before the first cash transfer). While the disbursement schedules for each treatment were intended to be identical, unexpected delays in the distribution of both cash and food caused deviations in transfer timing. The first distribution cycle for cash began on November 22, 2011 (duration of 25 days), while the second started on January 5, 2012, and the third began on February 22, 2012, all with identical duration periods (WFP-Yemen 2012). In contrast, the first food disbursement began August 3, 2011, prior to the baseline survey, and the second transfer began in late October. The final food transfer, however, did not occur until April 2012. Differential timing of modality receipt represents a significant challenge in comparability. Despite these temporal incongruities, the aggregate value of transfers preceding the endline survey remains comparable across modalities. Schwab (2013) shows that the randomization achieved balance across baseline characteristics.

III. Data

In all three countries, baseline and endline data were collected that included detailed food consumption and expenditure modules and nonfood expenditure modules. Modules were designed to provide comparability across countries while allowing them to be specific to items

consumed in the local context. Data from these modules are used to construct outcome measures including the value of food consumption per adult equivalent, the value of total consumption per adult equivalent, the share of food in total consumption, and the share of each of the seven food groups in food consumption.

Sample sizes for each country were based on power calculations using secondary data to determine the sample design needed to detect a 10 percent increase in food expenditure per adult equivalent and in dietary diversity. Sample sizes at baseline are 2,357 households in Ecuador, 2,568 in Uganda, and 1,581 in Yemen. Across all three countries attrition rates from baseline to endline are relatively low (10% attrition for Ecuador, 4% for Uganda, and 1% for Yemen) and the probability of attrition does not differ across intervention arms (for more details on attrition, refer to Hidrobo et al. (2014); Gilligan et al. (2013); and Schwab et al. (2013)). The sample used for this analysis consists of households that were resurveyed at endline and reported consuming food in the last week.[8] In Yemen, we also exclude those who received a transfer fewer than 8 days prior to the endline survey.[9] These exclusions result in the following sample sizes: 2,111 households in Ecuador, 2,357 in Uganda, and 1,581 in Yemen.

3.1.Outcome indicators

Household food consumption aggregates are constructed from the value of food eaten in the home in the last seven days. Food eaten in the home is composed of different food items consumed not only from food purchased in the marketplace but also food produced at home, food received as gifts or remittances from other households or institutions, and food received as payments for in-kind services. Median prices from food purchased are used to calculate the total value of food consumed from home production or received as gifts or in-kind payments. Weekly household values of food consumed are converted to monthly values, which are then converted to adult equivalent values. Adult equivalent values are calculated using the following formula: $AE = (Adults + \propto Children)^{\theta}$ where $\propto = .5$ and $\theta = 1$ (A. Deaton & Zaidi, 2002).

Total consumption per adult equivalent is constructed from a household's nonfood and food consumption. Nonfood consumption is calculated from the value of items purchased or acquired in the last month or three months. Items purchased or acquired include health and education expenses in addition to items which varied slightly by country such as personal care, home and kitchenware, communication (telephone and internet), electricity and gas, transportation, water, housing (rent and repairs), entertainment, beauty services, clothing,

[8] Households who report consuming 0 food in the last week at endline are converted to missing.

[9] Because survey instruments collected consumption data based on 7 day windows, these households were excluded to reduce variation in intensity of treatment among the food modality (all cash transfers were distributed more than 8 days from the survey date). The exclusions do not unbalance the baseline characteristics by treatment arm (Schwab 2013).

furniture and electronics, jewelry, toys, and tobacco.[10] All values are converted to monthly adult equivalent values.

In order to estimate the impact of transfers on consumption patterns and food Engel curves, we calculate each household's share of total consumption devoted to food by dividing the monthly value of food consumed per adult equivalent by the monthly value of total consumption per adult equivalent. In addition to calculating the food share, we calculate shares of food consumption for the following 7 food groups: starches and tubers; fruits and vegetables; meat, seafood, eggs; pulses, legumes, nuts; dairy; oils and fats; and other. Shares of food consumption devoted to specific food groups are calculated by dividing the value of the specific food group by the value of food consumed.

Table 2 reveals large differences in consumption patterns across Ecuador, Uganda, and Yemen. In particular, the share of total consumption devoted to food is much smaller in Ecuador and Yemen (40% and 56%, respectively) than in Uganda (82%), which is consistent with cross country patterns that demonstrate that poorer households and countries spend larger shares of their total consumption on food. In Yemen and Uganda the share of total consumption spent on education is trivial (2% and 1%, respectively), while in Ecuador it is much larger (23%). Food consumption patterns also vary significantly across countries. Although all three countries devote the largest share of food consumption to starches and tubers, the share ranges from 37 percent in Ecuador to 57 percent in Yemen. Uganda and Ecuador have similar shares devoted to fruits and vegetables (21% and 18%, respectively) while in Yemen it is much lower (7%). The share of food consumption devoted to meats, seafood, and eggs is also very low in Yemen and Uganda (6% for both countries) while in Ecuador it is 21 percent.

3.2.Balance of outcome variables

With randomized assignment to treatment, outcome variables and other household characteristics should be balanced at baseline, with equal means across intervention arms. However, it is possible that means are not balanced by chance, due to sampling error in small samples. When outcomes are balanced at baseline, analysis of the impact of the interventions is justified using single-difference comparison of mean outcomes across intervention arms at endline. We compare baseline means of the outcome variables across intervention arms in Ecuador and Uganda (for a full set of balancing tables refer to Hidrobo et al. (2014); Gilligan et al. (2013)). For Yemen, we do not provide balance tables for consumption variables due to the differential timing of the baseline survey with respect to the first food and cash distribution. Schwab (2013) shows that the randomization achieved balance across modalities on key household characteristics unlikely to be impacted by the first transfer, such as household composition and

[10] As recommended by Deaton and Zaidi (2002), we exclude taxes and ceremonies because they happen infrequently and often do not represent normal consumption patterns. Education expenses are only reported for children 4-18 years old and health expenditures are only reported for individuals who were sick in the last 4 weeks.

asset ownership. In Ecuador, across 78 (13 x 6) difference-in-means tests between the treatment and control groups, only two are statistically different at the 5 percent level (Table 3).[11] At baseline, voucher beneficiary households spent a greater share of their total consumption on other nonfood items and they spent a greater share of their food consumption on fruits and vegetables than cash beneficiary households. In Uganda, across 39 (13x3) difference-in-means tests, none are statistically different at the 4 percent level (Table 4). The randomization was very effective at achieving balance in the outcome variables across intervention arms in Ecuador and Uganda.

IV. Estimation of Engel curves

4.1.Description of Engel curve estimation

We present estimates of several Engel curves derived from household survey data in this section. We derive estimates of the relationship between the share of food in total household consumption and the log value of total household consumption, as well as between consumption shares of individual food groups and the log value of total food consumption.

To obtain an accurate representation of the shape of the Engel curves, we use nonparametric techniques. Discarding an assumed functional form permits the data to determine the shape of the relationship, which is our primary concern. The Engel curves are estimated by treatment group using Fan's (1992) locally weighted regression with a quadratic kernel and bootstrapped standard errors clustered at the level of randomization.[12] We then plot the differences in the curves across treatment group, along with their 95 percent confidence intervals, using the Fan regression estimates and bootstrapped standard errors. To limit the influence of outliers on the graphical display, we trim the tails at the five percent level on the x-axis in all graphs.

4.2.Ecuador

At baseline the food Engel curve for households in the Ecuador sample is downward sloping, revealing that as households become wealthier, a smaller share of their total consumption is spent on food (Figure 1). This is consistent with Engel's Law. As expected due to the successful randomization, there are virtually no differences across intervention arms in the shape and position of the curves at baseline. At endline, the Engel Curves for the food and cash arms have shifted up, revealing significant difference between food and the control arm and cash and the

[11] This is no more than would be expected by chance since we can expect that one out of 20 hypothesis tests would be significant at the 5 percent level by chance.

[12] The Fan method generates predicted values around each grid point using a weighted least squares estimator. See Deaton (1997) for another application of Fan's method to Engel curves.

control arm. Except for differences between cash and food at the very low end of the distribution (which also existed at baseline), there are no significant differences between the cash and the food arm at endline.

Figure 2 presents Engel Curves for each food group, graphing the share of the value of food consumption for each food group in total food consumption. Both starches/tubers and oils/fats have downward sloping curves, revealing that as households consume more food, the share they devote to starches and tuber and to oils and fats decreases. On the other hand, meats, seafood, and eggs, and dairy have upward sloping curves which reveals that as household increase their food consumption, they devote a larger share to these more "luxury" food items. Differences in consumption of food groups emerge across cash and food arms. In particular, the food arm devotes a significantly larger share of food consumption to pulses, legumes, and nuts than the cash or control arm, which may not be surprising given that a main component of the food transfer was lentils. On the other hand, the food arm devotes a significantly smaller share of food consumption to fruits and vegetables and to dairy than the cash arm.

4.3.Uganda

The most notable characteristic of the food Engel curves for Uganda is that they are largely upward sloping (Figure 3). At baseline, the Engel curves for the food and control groups are clearly upward sloping, while the Engel curve for the cash group is downward sloping at low levels of baseline log total consumption, but upward sloping in the upper half of the consumption distribution. Upward sloping food Engel curves are uncommon and are typically only seen among very poor populations. The Karamoja subregion of Uganda is certainly poor, with mean value of total consumption per adult equivalent at baseline in our sample of 46,115 Uganda shillings per month, which is equivalent to only $0.68 per adult equivalent per day. This extreme level of poverty helps to explain the very high baseline share of food in consumption at 82.1 percent. With a food consumption share that high, it may seem surprising that the food share would rise as incomes increase, however, with consumption levels so low, households still seek to improve their diets with additional income. This pattern of positive sloping Engel curves suggests that households have nonfood necessities that they must purchase despite being very poor, but that as income rises, they devote more of their income to food, perhaps using the additional income to improve food quality or diversity. As shown in Figure 3a, the difference between the Engel curve at baseline in the cash group and the food group or control group is significant at low levels of total consumption. This is consistent with the estimate of the average share of food consumption at baseline being somewhat higher in the cash group than in the food group or control group, although the difference in means was not significant.

At endline (Figure 3b), the Engel curves for all three intervention arms are upward sloping. For most of the distribution of total consumption, the food share is increasing faster for the food group than for the cash group as consumption rises, as seen in the upward slope of the

line in the difference graph. However, this difference is not significant. Overall, there are no significant differences in the food Engel curves at endline between any of the intervention arms.

Figure 4 shows the pattern of the share of food consumed in seven food groups at endline by intervention arm in Uganda. Starches and tubers show a downward sloping relationship between food group share and total food consumption for all three intervention arms. Meat, seafood and eggs show a clear upward sloping pattern, with these foods making up a higher share of food consumption as food expenditure rises. In some parts of the food consumption distribution, the share of these high protein sources in food consumption rises faster in the cash group than in the food or control group, and this difference is significant. For the other food groups, the food group share relationship is near flat or varies by intervention arm. The share of fruit and vegetables in food consumption is higher in the cash group than in the control group among very poor households with lowest food consumption, and this difference is significant. The share of legumes in food consumption is rising faster with food consumption in the cash group than in the food or control group, and this difference is just significant at the 5 percent level at a couple of points of the food consumption distribution. The food share for dairy is highly variable in the cash group, but is significantly higher than in the food or control group in small portions of the food consumption distribution. For the other food groups (oils and fats and other), there is no significant difference in the food group share curves across intervention arms.

4.4.Yemen

Yemenis devote a moderate percentage of their consumption to food, 56.3 percent at baseline (Table 2). Engel curve estimates from both the baseline and endline surveys demonstrate that the food share of consumption declines steadily with total consumption for both treatment groups (Figure 5). Though both baseline and endline Engel curves slope downwards, and the initiation of the first food (but not cash) transfer before the baseline limits the interpretation, two important differences distinguish the curves at each round. First, the slope of the decline is much steeper in the baseline, suggesting that both cash and food transfers propped up food demand at nearly all levels of consumption. Second, while the level of the curves for each treatment group in the baseline is nearly identical and their difference is not significantly different at any level, the endline food share exhibits a small but pronounced 'hump' at low levels of consumption for food recipients. The difference in the curves is significantly different from zero at this hump. The absolute level of the difference is small, but is suggestive of the fact that very poor food recipients are relatively less likely to diversify consumption away from food than those receiving cash. This suggests that in-kind transfer 'stickiness' is higher at low levels of consumption.

As expected, at endline, starches and oils demonstrate a downward sloping share of food consumption, while consumption of meat and dairy products increase in a manner consistent with a luxury item (Figure 6). Engel curves for fruits and vegetables and pulses, both small

shares of the diet in the population under study, are relatively flat. The food basket distributed in Yemen consisted of wheat and oil, which is reflected in the relative levels of the Engel curves by treatment for these food groups. Consumption shares of starches and oils are significantly higher for food recipients relative to the cash group at nearly all levels of total food consumption. In contrast, the share of meat consumption in the cash group exceeds the share among the food group over the range of consumption levels, at some points substantially so. Thus, while the relative impact of each modality on overall food consumption shares differs at a small level over a confined range of consumption levels, the makeup of food choices exhibits much greater contrasts.

4.5. Synthesis

This exploration of food Engel curves shows mixed effects of food and cash transfers on food consumption patterns. In Ecuador, both the food and cash transfers lead to a significantly higher share of food in total consumption, particularly in the lower half of the consumption distribution. The transfer programs shift the Engel curves of poorer households in Ecuador in favor of higher food consumption, although these effects do not differ by transfer modality. The shift out in food Engel curves of both cash and food transfers may be due to some learning by beneficiaries that transfers are meant to be spent on food or to program-induced changes in preferences in favor of food consumption such as targeting transfers to women. In Uganda, there is no effect of either food or cash transfers on food Engel curves. In Yemen, there is no difference in food Engel curves between food and cash beneficiaries. We conclude from this evidence that there is no difference between cash and food transfers on the *relative* effect on the food share of consumption at any income level in these three countries, although the evidence of the *overall* effect of transfers on food shares varies.

We also compare the effects of food or cash transfers on the composition of diets as measured by food group shares. In Ecuador and Yemen, there is some stickiness of food transfers in the sense that the food group share of the foods provided in the food ration increases (this occurs for legumes in Ecuador and starches and oil in Yemen). In all three countries, cash leads to larger improvements than food in the quality of diets by increasing the share of meat and eggs in food consumption (Uganda and Yemen), increasing the share of fruits and vegetables (Ecuador), or increasing the share of dairy (Uganda and Ecuador).

V. Estimation of treatment effects

5.1. Methodology

The Engel curves in Section 4 show descriptively, for each intervention arm in each country, – the relationship between food share and total consumption, as well as between food group shares and food consumption. Since these relationships are implied by demand curves for food, the Engel curves should not change as households gain income unless the programs contribute to changes in the determinants of household demand. That is, if the only effect of the transfer program is an increase in income, then the transfers would move households along the Engel curves but would not cause a shift in the Engel curves. The Engel curves therefore also give predictions for how – in the absence of factors causing a demand shift – any change in total consumption due to the treatments should relate to a change in food share, as well as how any change in food consumption due to the treatments should relate to a change in food group shares.

In this section, we directly estimate the treatment effects in each country on total consumption, food consumption, food share, and food group shares. As noted above, any differences we see in Engel curves across intervention arms suggest that receiving transfers may in fact have fundamentally shifted demand. Here, we use parametric techniques to explore whether receiving transfers appears to have caused shifts in demand and whether these shifts differ by transfer modality.

In the estimation, to the extent possible, we choose specifications that are consistent across the case studies. In all three countries, we estimate average "intent to treat" impacts based on the randomized assignment of treatment, which avoids bias due to any non-compliance.[13] Because baseline data are not valid in the Yemen case study and because the treatment arms are randomly assigned in all three case studies and outcomes are well balanced, for consistency we estimate single-difference treatment impacts in all three countries.[14] We also use a parsimonious set of control variables, including for each case study only dummy variables controlling for the strata at which the randomization was conducted. All specifications are estimated using OLS regressions and standard errors are clustered at the level of randomization. The specifications of treatment effects are therefore very similar across countries and differ only in terms of the treatment arms included.

[13] Non-compliance refers in these case studies to households that are assigned to a treatment but do not report receiving any transfers. Non-compliance rates are very low in all three case studies (less than 5 percent in Ecuador; 1-2% for both the food and cash arms in Uganda; approximately 5 percent in Yemen), suggesting that average "intent to treat" impacts are a close approximation to average "treatment on the treated" impacts.

[14] Given that balancing at baseline is demonstrated across treatment arms in both Ecuador and Uganda, the single-difference estimates using only endline data should not be biased. We confirm this assumption by using the baseline data to additionally run ANCOVA specifications for all impact estimates in Ecuador and Uganda. We find no meaningful differences in point estimates, although as expected, precision of the estimates is slightly improved when baseline information is included.

For Ecuador, we define an indicator $Food$ – which takes the value 1 for households assigned to the food treatment and 0 for households assigned to the cash, voucher, or control group; indicators $Cash$ and $Voucher$ are constructed analogously. Given N strata, we create indicators $Strat_1$ ... $Strat_{N-1}$ for all but one of the strata, which in Ecuador's case consists of two strata for the provinces of Carchi and Sucumbíos. For each outcome Y_t – which represents the value of total consumption, value of food consumption, food share in total consumption, or food group share in food consumption – we estimate the following and take β_1, β_2, and β_3 as the treatment effects of being assigned to each modality relative to being assigned to the control group. To test whether the treatment effects are statistically different across treatment arms, we conduct Wald tests of equality and report the p-values.

$$Y_t = \beta_0 + \beta_1 * Food + \beta_2 * Cash + \beta_3 * Voucher + \alpha_1 * Strat_1 + \cdots + \alpha_{n-1} * Strat_{n-1} + \varepsilon_t.$$

For Uganda, we define an indicator $Food$ – which takes the value 1 for households assigned to the food treatment and 0 for households assigned to the cash treatment or the control group; an indicator $Cash$ constructed analogously; and given N strata, indicators $Strat_1$ ... $Strat_{N-1}$ for all but one of the strata. For each outcome Y_t – as in Ecuador – we estimate the following and take β_1 and β_2 as the treatment effects of being assigned to each modality relative to being assigned to the control group. To test whether the treatment effects are statistically different across treatment arms, we conduct Wald tests of equality of means and report the p-values.

$$Y_t = \beta_0 + \beta_1 * Food + \beta_2 * Cash + \alpha_1 * Strat_1 + \cdots + \alpha_{n-1} * Strat_{n-1} + \varepsilon_t.$$

For Yemen, we define an indicator $Food$ – which takes the value 1 for households assigned to the food treatment and 0 for households assigned to cash treatment; and given N strata, indicators $Strat_1$ ... $Strat_{N-1}$ for all but one of the strata. For each outcome Y_t – again as in Ecuador – we estimate the following and take β_1 as the treatment effect of being assigned to cash relative to being assigned to food.

$$Y_t = \beta_0 + \beta_1 * Food + \alpha_1 * Strat_1 + \cdots + \alpha_{n-1} * Strat_{n-1} + \varepsilon_t.$$

5.2. Ecuador

Table 5 reveals that all three treatment arms significantly increase the value of food and total consumption, with larger percentage increases across food consumption than total consumption. Consequently, food shares increase by 2-3 percentage points, which suggests fundamental shifts in households' demand for food. There are no significant differences across treatment arms in the size of the impact, thus all three treatment arms lead to similar changes in the demand for food.

Although all three treatment arms lead to similar increases in the demand for food, the types of food being demanded are different across treatment arms (Table 6). In particular, food

transfers lead to significant increases in the share of food consumed devoted to meats, seafood, eggs, and pulses, legumes, nuts. This is not surprising given that the food transfer was composed of sardines and lentils. The fact that cash leads to significantly smaller increases in these food shares suggests that these food items were extramarginal and that there was some stickiness in the form of transaction costs in the market that led households to consume these items as oppose to selling them. On the other hand, cash leads to significant increases in the share of food consumption devoted to fruits and vegetables, and dairy, and these increases are significantly larger than the impact of food. All three arms lead to significant decreases in the share of food devoted to starches and tubers, cash and vouchers lead to significant decreases in the share of food devoted to oils and fats, and food and vouchers lead to significant decreases in the share of food devoted to other food groups. These decreases in less healthy food items and increases in healthier food items indicate that households' food preferences and diets improved as a result of the transfer program. While some of the increase might be attributable to an income effect, comparison with the control group's Engel curves suggests that other factors might also be at play. For example, the Engel curve for pulses, legumes, and nuts shows that as income increases, the amount of food devoted to this group slightly decreases. The fact that we observe positive treatment effects on this food group implies that other factors apart from income are also shifting household's demand for particular food groups.

5.3. Uganda

Table 7 shows that the food treatment in Uganda has no significant effect on the value of households' food consumption, the value of their total consumption, or the share of total consumption allocated to food. The food transfers' lack of effect on food and nonfood consumption gives additional support to the possibility that many food beneficiary households may have run out of the food transfer before the endline survey, muting its effects on food consumption in the previous 7 days. In effect, these results suggest that food beneficiary households fell in the same spot on the Engel curves as control households by the time of the endline. The cash treatment, however, significantly increased both the value of food consumption (by about 20 percentage points) and the value of total consumption (by about 17 percentage points), with no meaningful change in the *share* of consumption allocated to food (a statistically insignificant increase of less than 1 percentage point). This pattern is consistent with movement along the estimated Engel curves, which are relatively flat outside the tails and indicate that food share increases very little as total consumption increases.

Table 8 shows impacts of the two treatments on shares of food consumption allocated to various food groups in Uganda. Again, there are no significant impacts from the food treatment. However, the cash treatment causes a significant increase of 4.5 percentage points in the food group share of meat/seafood/eggs, as well as a small but statistically significant increase of 0.6 percentage points in the food group share of dairy. Consistent with the food group Engel curves,

these results indicate that as cash beneficiary households increased their food consumption, they also increased the relative share consumed of these two "luxury" food groups.

To summarize, impact estimates from the Uganda case study indicate that the cash treatment caused similar increases in households' food consumption and total consumption, leading to little change in food share. However, cash transfers did change the composition of food groups consumed. Cash beneficiary households consumed significantly more meat/seafood/eggs and slightly more dairy. All of these patterns are consistent with the estimated Engel curves, which suggest that food shares are relatively flat with respect to total consumption, but both the meat/seafood/eggs food group and (to some extent) the dairy food group appear to be "luxury" goods with respect to food consumption. No significant effects appear from the food treatment, likely due to the food transfer having been delivered earlier than the cash transfer and depleted prior to the endline survey. As such, the treatment impacts in Uganda are consistent with households moving along Engel curves (or in the case of the food treatment, not moving at all). In contrast to the Ecuador case study, the Uganda case study shows no evidence that the food demand of beneficiary households fundamentally shifted.

5.4. Yemen

Table 9 compares the relative impact of food and cash transfers on the relative value of food consumption, total consumption, and the food share of total consumption. For all three outcomes, the negative sign on the coefficient indicates that the cash treatment leads to slightly higher values. The magnitude of the difference implies that cash recipients have approximately 1 percent higher food and total consumption than food recipients, respectively. However, no effect is statistically different from zero.

Larger differences in the food and cash treatments emerge in the food group share analysis (Table 10). Consistent with the Engel curve analysis, as a proportion of the value of their overall diet, cash beneficiaries consume 2.6 percentage points, nearly 50 percent of the baseline mean, more non-dairy animal products than food households. Food households consume more starch and oil, though the former difference is not significant at conventional levels.

The findings suggest that food transfers are inframarginal with respect to overall food/nonfood consumption, but extramarginal in their composition. That is, the in-kind value of the transfer is similar to the value that would have been consumed given an equal valued budget increase, but households prefer to purchase a wider diversity of foods than wheat and oil, particularly animal products.

5.5. Synthesis

These results confirm that the transfers lead to increases in food and total consumption in Ecuador and Uganda. However, the effects indicate a move along the Engel curve in Uganda, while in Ecuador the effects indicate a shift out in the Engel curves. In all three countries, there are no differences on the relative impact of food and cash on the share of consumption devoted to food.

Although food and cash lead to similar impacts on the share of consumption devoted to food, differences emerge in the composition of food consumption, with improvements in diets generally being greater for the cash group than food group. Cash leads to larger increases than food in the share of food consumption devoted to meats/seafood/eggs (Yemen and Uganda), dairy (Uganda and Ecuador) and fruits and vegetables (Ecuador). Food leads to larger increases in food items that make up the food ration in both Yemen and Ecuador, indicating stickiness of the food rations.

VI. Evidence for shifts in intrahousehold bargaining

6.1. Motivation

As shown in Section 5, the pattern of treatment effects found in our case studies suggests that, at least in the case of Ecuador, receipt of transfers appears to have shifted household demand for food, as opposed to simply inducing movement along the curve. Given the features of the Ecuador intervention, there are two main candidate explanations for why all three treatments may have shifted demand for food. One possible explanation is that the nutrition trainings linked to the transfers caused a fundamental change in household members' preferences for food, either through those individuals learning about the benefits of nutritious foods or through their "labelling" the transfers as intended for food. A second possible explanation is that preferences of individual household members remained unchanged, but that receipt of transfers shifted intrahousehold bargaining power toward an individual in the household with relatively higher preferences for food.

In this section, we explore evidence for the second explanation – that the receipt of transfers may have shifted household demand by inducing a change in intrahousehold bargaining power. A growing literature supports rejection of the unitary household model, in which household members pool resources and share identical preferences. Evidence suggests instead that household members may have different preferences, and that individual control over resources within the household determines intrahousehold bargaining power. In the Ecuador case study, transfers were given preferentially to women. If these transfers remained in control of women, the receipt of transfers could have plausibly increased women's bargaining power

within the household. If women moreover had stronger preferences for food than men, the transfers may have increased the overall household demand for food.

The mechanism we describe has been proposed regarding other transfer programs as well. In the context of Mexico's *Oportunidades* conditional cash transfer program, Angelucci and Attanasio (2013) show that receiving transfers caused an increase in households' food share despite evidence of a downward-sloping food Engel curve. They argue that providing cash transfers to women may have shifted intrahousehold bargaining power toward women. Their evidence draws on predictions from linear Engel curves estimated using IV, which appear more similar to estimated treatment effects within a subsample of female-headed households (among whom there would be limited scope for transfers to shift bargaining power) than within a subsample of male-headed households. They interpret this similarity as indicating that Engel curves appear to have shifted less in female-headed households (where women likely had sole decisionmaking power even prior to the intervention) than in male-headed households (where there was more potential for women's decisionmaking power to increase in response to the intervention).

Here we take a slightly different approach to exploring a similar issue.[15] We estimate treatment effects similar to Section 5, but now incorporate an additional term that interacts each treatment indicator with whether a household is female-headed at baseline with no males aged 18 years or older in the household. In such households, it is plausible that women truly are the sole decision makers regarding the use of transfers at baseline. As a result, it is unlikely that the relative bargaining power of women could increase substantially in this subset of households. If estimates in these specifications indicate that there are positive treatment effects on the share of total consumption devoted to food in male-headed households, but not in female-headed households, we could interpret this finding as supporting the possibility that household food demand increases due to shifts in intrahousehold bargaining. On the other hand, if we see similar positive treatment effects across male-headed households and this subset of female-headed households, we may infer that a different mechanism is playing a role – such as the nutrition trainings and labeling fundamentally changing preferences.

While Section 5 does not show similar evidence of shifts in food demand within the Uganda and Yemen case studies, we estimate the interactions for all three case studies here, in order to compare patterns and explore the role of intrahousehold dynamics in each.

6.2. Ecuador

[15] We prefer not to impose linearity on Engel curves, given indications from our nonparametrically estimated Engel curves that there is considerable non-linearity. Therefore we cannot use Angelucci and Attanasio's methodology to infer predictions of the Engel curves.

Table 11 reveals large and significant increases across treatment arms in the value of food and total consumption for households with males over the age of 18. Although still positive, the impact on food shares is not significant for these households. Impacts on food shares are larger for households with female heads and no males over the age of 18 years, and this difference is significant for the food and voucher arms. Given that intrahousehold bargaining most likely did not change for female headed households, yet they experienced large increases in the proportion of total consumption devoted to food, a different mechanism must be causing the increase in their food shares.

6.3. Uganda

Table 12 shows disaggregations in treatment impacts for the Uganda case study by whether a household has a female head and no males over 18 at baseline (hereafter referred to as a "female-headed household" as shorthand). Treatment impacts on food consumption, total consumption, and food share do not differ significantly between female-headed households and other households. Coefficients on the "female-headed" treatment interaction terms are all statistically insignificant. We do note that the female-headed subsample is quite small in the Uganda case study (only about 5% of the overall sample). However, if these results were to support a story that transfers caused a shift in intrahousehold bargaining power toward women that favored food consumption, the coefficients on the interaction terms for food consumption and food share should be negative; point estimates on the estimated coefficients are instead positive. We conclude that the treatment impacts we see in aggregate are unlikely to be driven by the transfers causing a shift in intrahousehold bargaining power toward women.

6.4. Yemen

Disaggregating the treatment effects estimates by female headship reveals that household composition does not affect the relative modality impact on overall consumption levels in the predicted manner (both food and total). While only 9 percent of the households in the Yemen sample have female heads and no adult males, this subset of households that receive food transfers consume a relatively higher food share than similarly situated cash recipients (Table 13).

The fact that relative to the cash group, higher food consumption shares prevail among female headed food beneficiaries, but not among male headed households, does not suggest that transfers changed the intrahousehold bargaining structure or food share preferences of households. Indeed, these results imply that food transfers were 'stickier' among households with no adult males. One potential explanation is that a combination of liquidity constraints and reduced market access for such households hinder reallocation of budgetary resources away from

food. However, the lack of a control group in Yemen hinders our ability to make strong conclusions on the absolute relevance of these effects.

6.5. Synthesis

Overall, we find no evidence for changes in intrahousehold bargaining power as a result of the transfer programs under any modality in all three countries. Instead we find that in Ecuador and Yemen the share of consumption devoted to food is significantly larger for female headed households in the food arm than male headed households in the food arm. This suggests that food transfers are stickier in households with no male adults. Given that we find no change in intrahousehold bargaining in Ecuador, where all three transfer modalities appear to have shifted food Engel curves, the source for this change in demand for food more likely derives instead from changes in nutrition information or a response to labeling of the transfers as being intended for food consumption.

VII. Discussion and conclusion

Our results present a much more varied picture of the relative impact of food and cash transfers than is available from the existing literature. Although the transfers are inframarginal with respect to food in all three countries, transfers in the form of food, cash or vouchers in Ecuador lead to an increase in the share of food in total consumption, shifting out the food Engel curves. In Uganda, where food Engel curves are upward sloping, cash transfers (not food) increase food and total consumption but do not significantly increase the food share of consumption. In Yemen, there is no significant difference in Engel curves between food and cash beneficiaries. Despite this variability in overall impacts on the food Engel curves across countries, we find no evidence of differential effects of food and cash transfers on the food share of consumption.

The effect of transfer modality on the composition of consumption in terms of food group shares varies by country, but is consistent with an improvement in the quality of diets as a result of cash transfers. Cash leads to larger increases than food in the share of food consumption devoted to meats/seafood/eggs (Yemen and Uganda), dairy (Uganda and Ecuador) and fruits and vegetables (Ecuador). Food leads to larger increases in food items that make up the food ration in both Yemen and Ecuador, indicating stickiness of the food rations. We also find no evidence for changes in intrahousehold bargaining power as a result of the transfer programs under any modality in all three countries. Instead, the stickiness of food rations appears to be greater in female headed households with no males.

Given that we find no change in intrahousehold bargaining, but that in Ecuador all three transfers lead to fundamental changes in household's demand for food, the likely explanation for

such shift in demand are the nutrition training and information campaigns. Throughout the program duration there was also a strong campaign composed of posters which linked the transfers to healthy families eating nutritious foods. Consequently, the nutrition trainings and campaigns may have caused a fundamental change in household members' preferences for food, either through those individuals learning about the benefits of nutritious foods or through their "labelling" the transfers as intended for food. These nutrition trainings and information campaigns only occurred in Ecuador, and thus could explain why we only see shifts in demand for food in Ecuador and not Yemen or Uganda.

Our results suggest that the current debate over the relative effectiveness of food and cash transfers is exaggerated and many times dominated by ideology and politics. In particular, we do not find that food transfers are uniquely capable of increasing the food share of total consumption or of improving the quality of food consumed. Instead, our evidence suggests that the effects of food and cash transfers will depend importantly on the quality of the implementation of the transfer schemes and the diversity of food provided in food rations. Policy and intervention design discussions need to shift from their current ideological and political focus to one that emphasizes greater precision of the intervention's objective, better understanding of the context, and greater emphasis on the cost of delivery of the transfers. In the three countries studied, cash transfers were less costly to implement and lead to improvements in dietary diversity, suggesting that they are the preferred modality for the objectives considered here.

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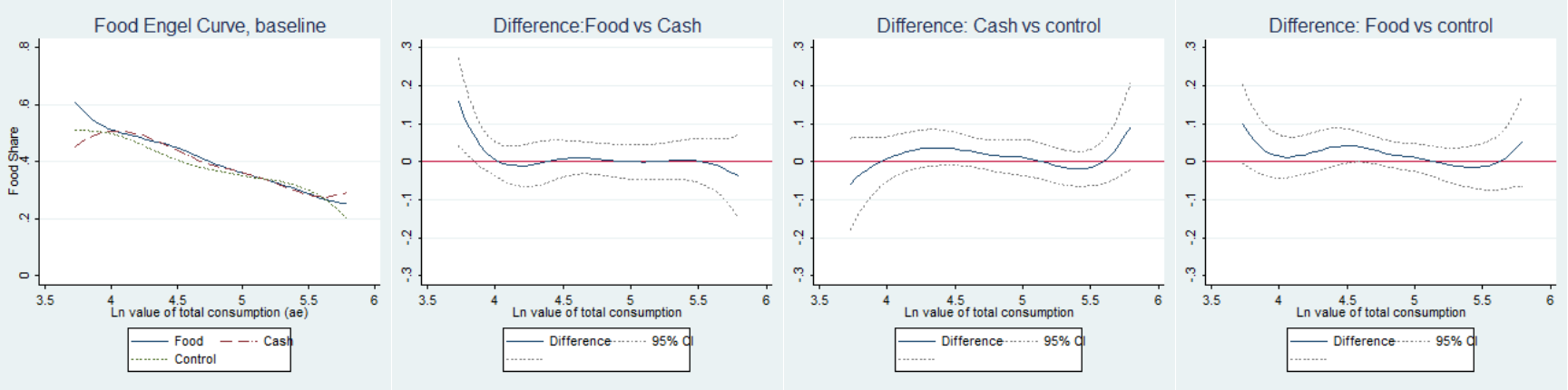
IX. Figures

Figure 1. Food Engel curves, Ecuador

a. Baseline



b. Endline

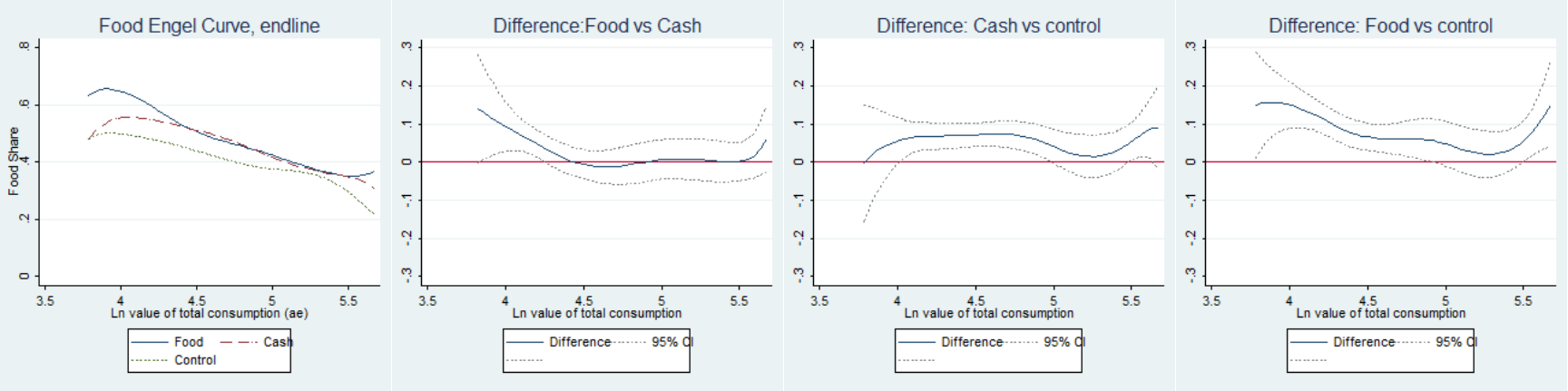
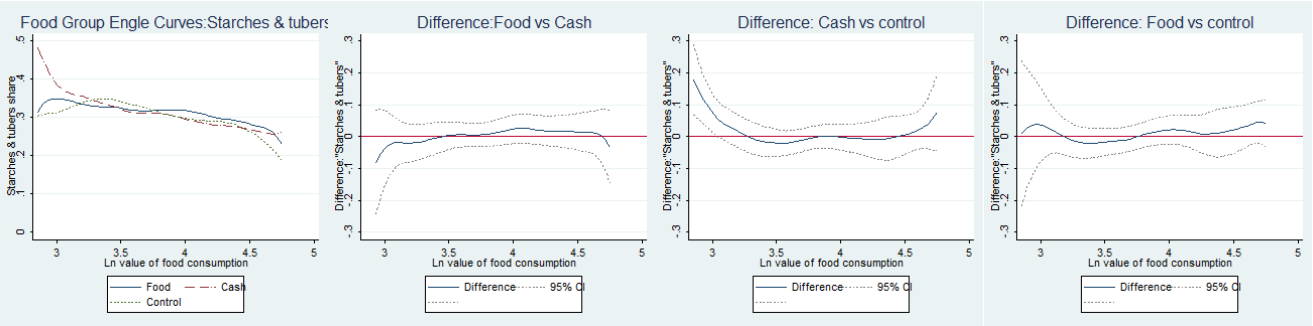
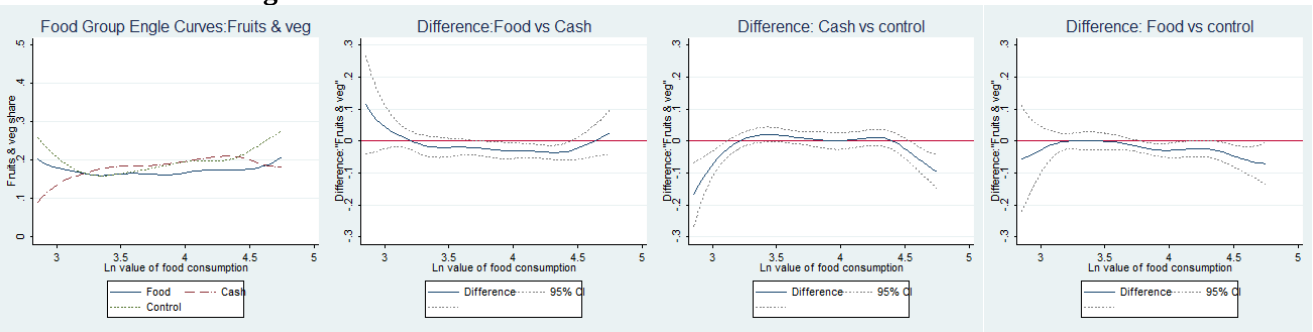


Figure 2. Food group Engel curves at endline, Ecuador

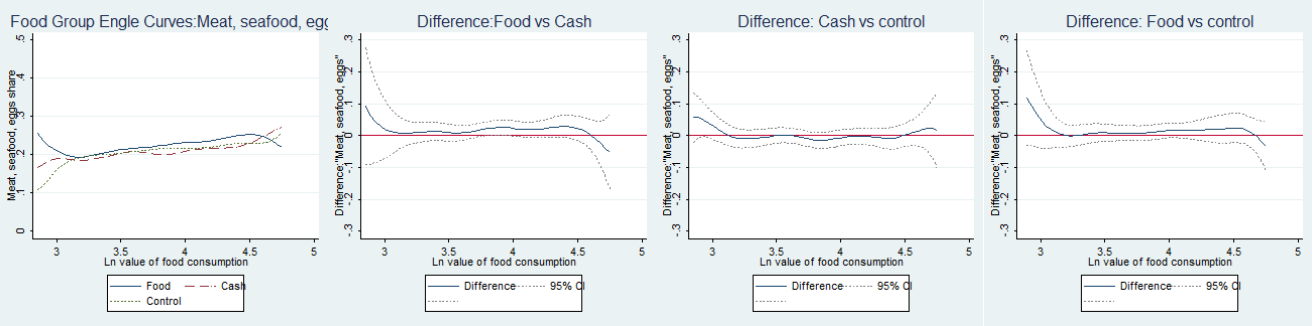
a. Starches and tubers



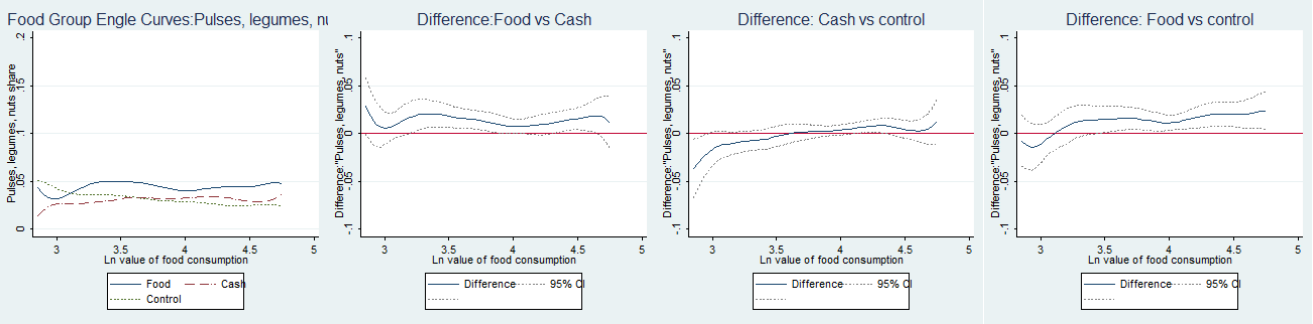
b. Fruits and vegetables



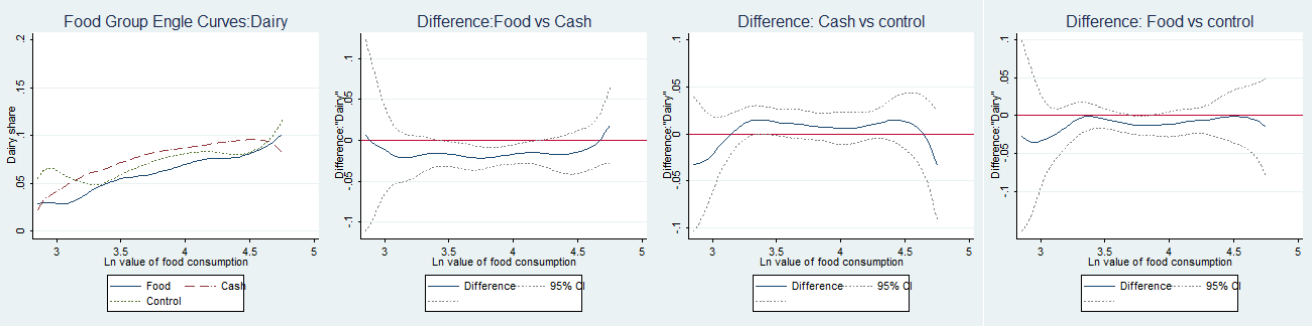
c. Meat, seafood, eggs



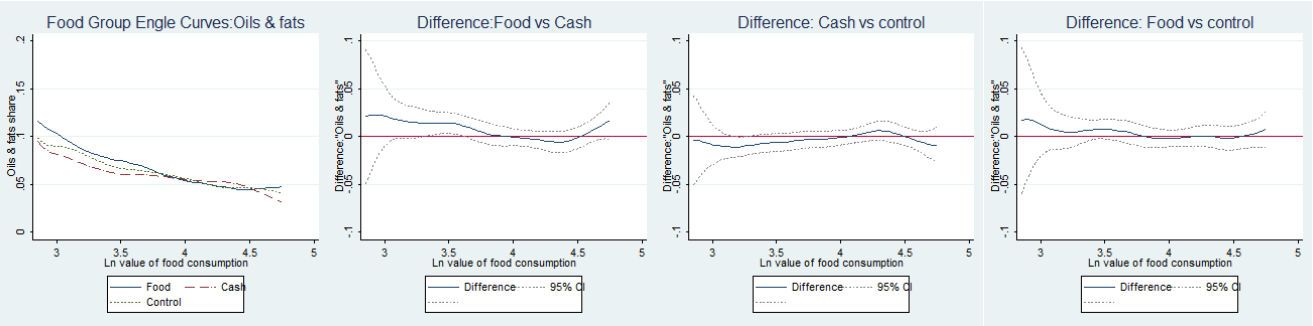
d. Pulses, legumes, nuts



e. Dairy



f. Oils and fats



g. Other

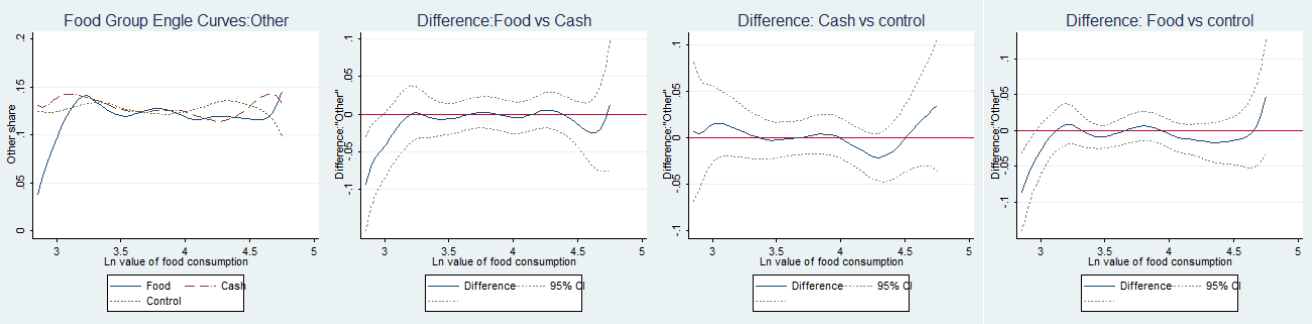
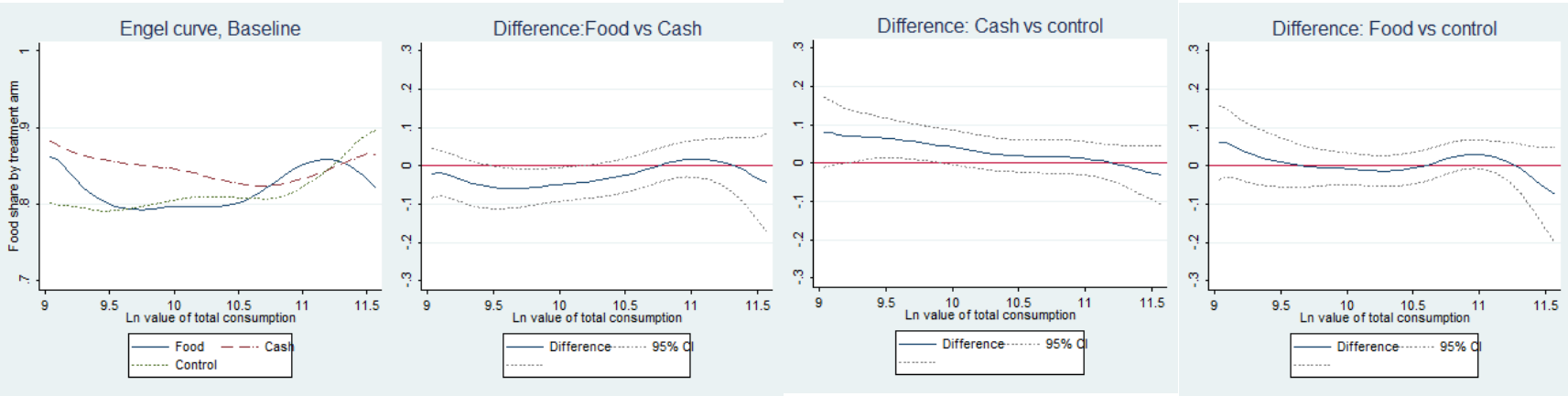


Figure 3. Food Engel curves, Uganda

a. Baseline



b. Endline

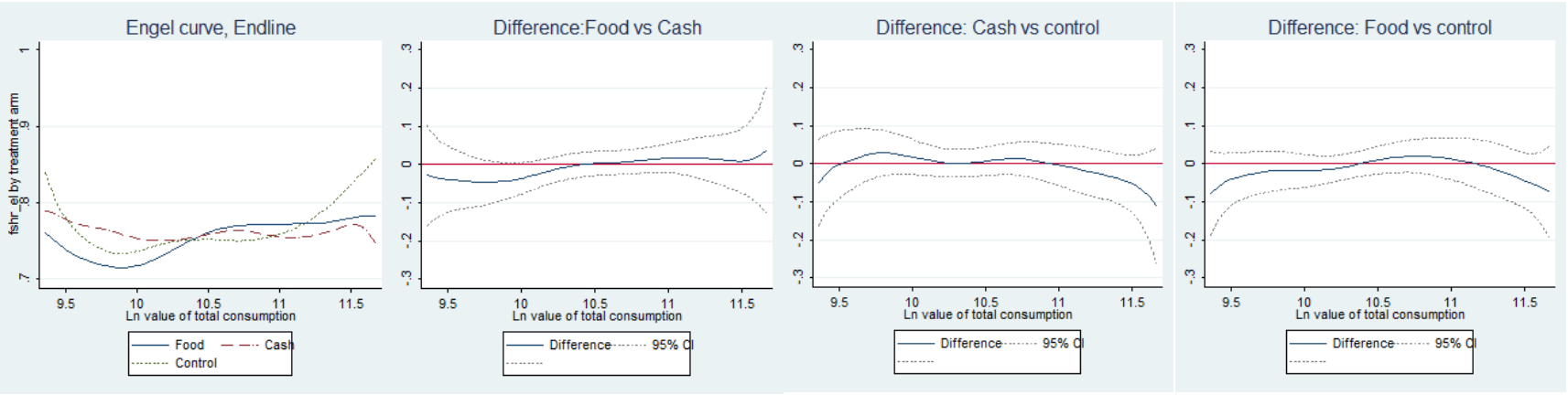
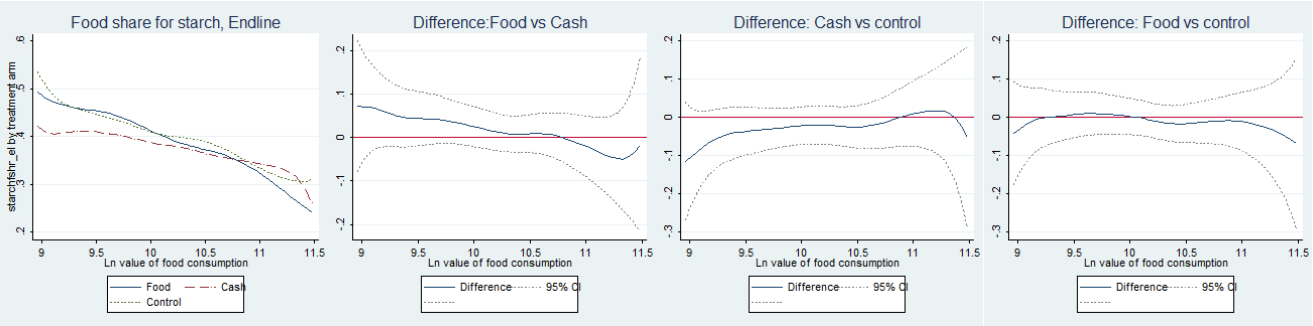
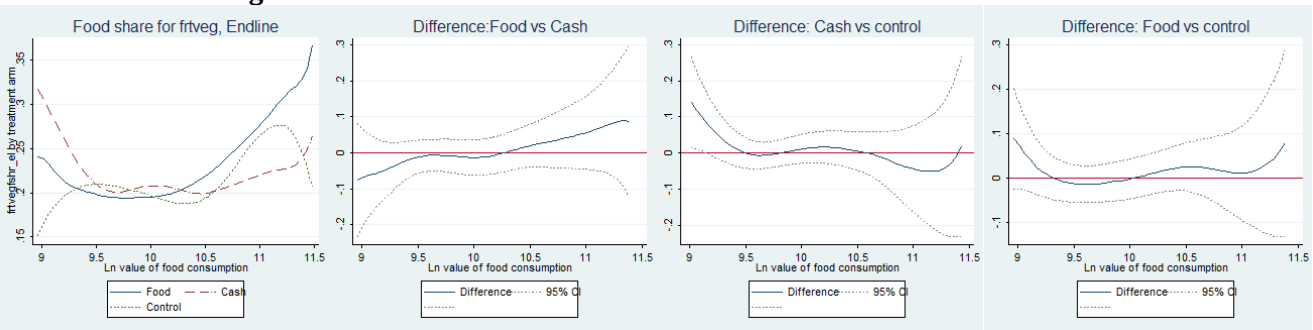


Figure 4. Food group Engel curves at endline, Uganda

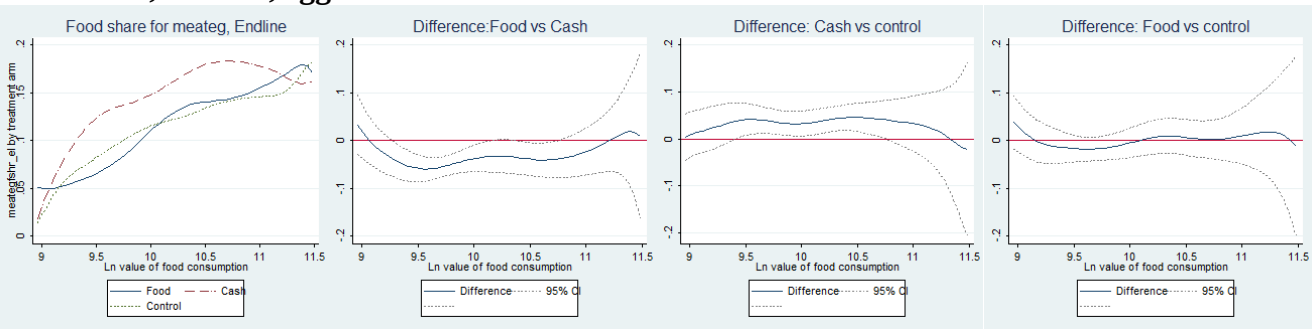
a. Starches and tubers



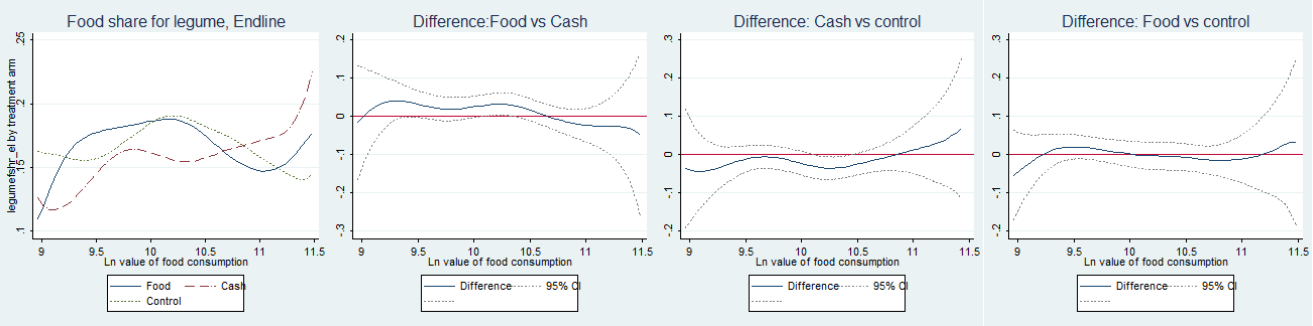
b. Fruits and vegetables



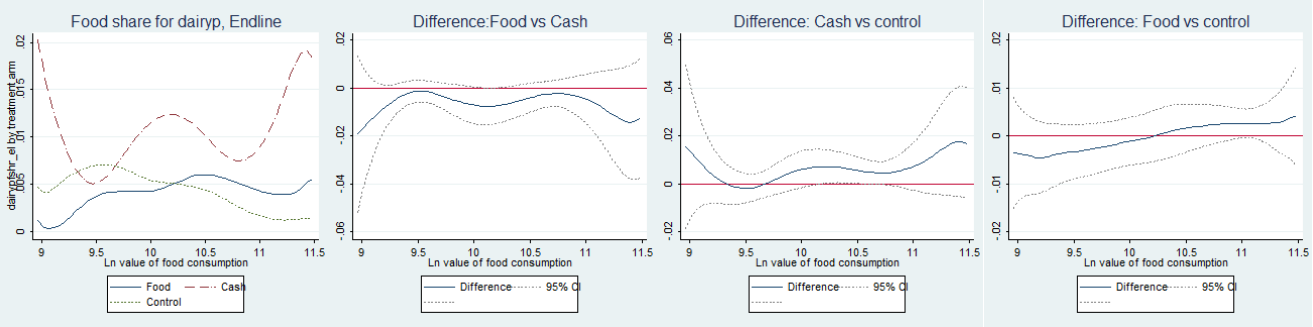
c. Meat, seafood, eggs



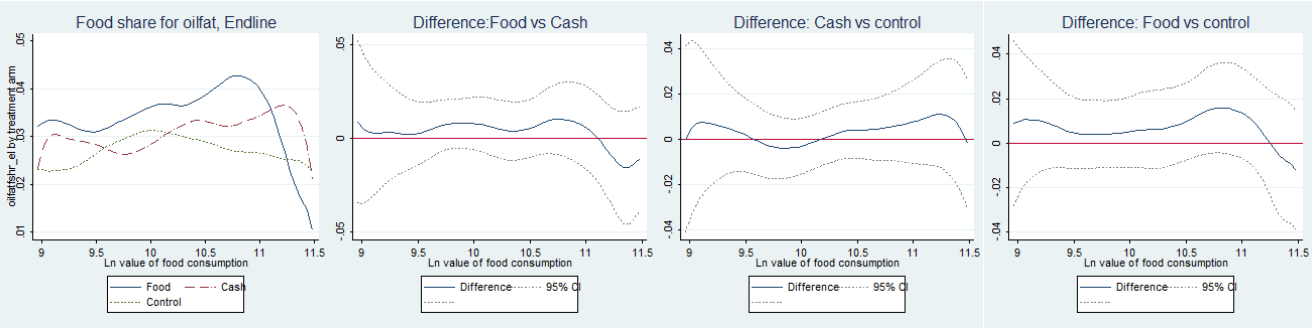
d. Pulses, legumes, nuts



e. Dairy



f. Oil and fats



g. Other

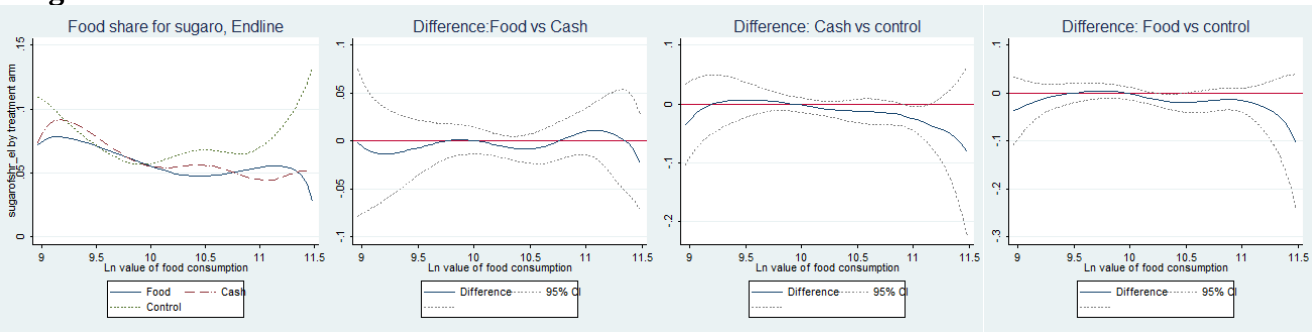
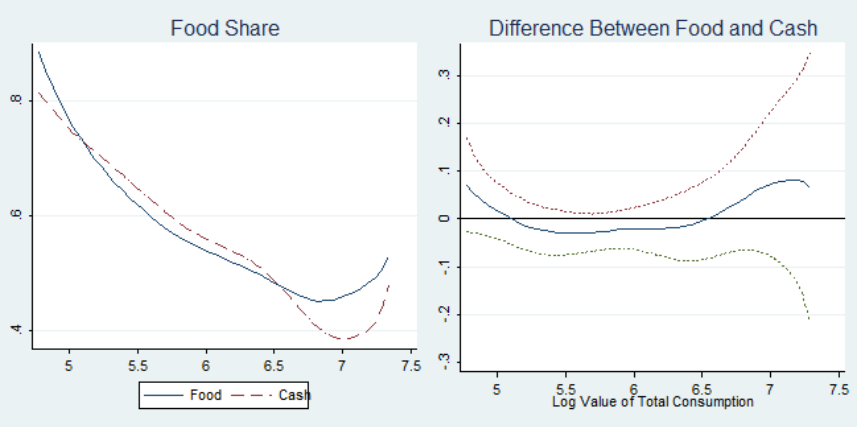


Figure 5. Food Engel curves, Yemen

a. Baseline



b. Endline

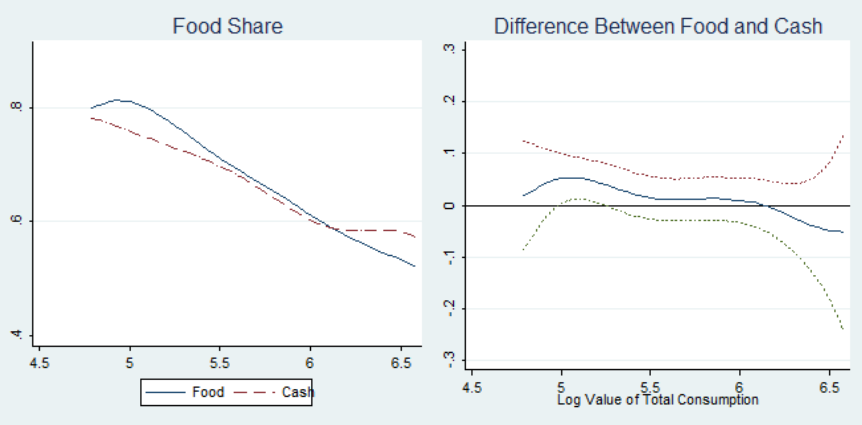
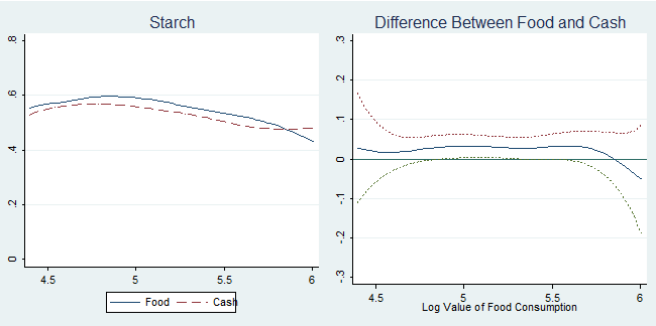
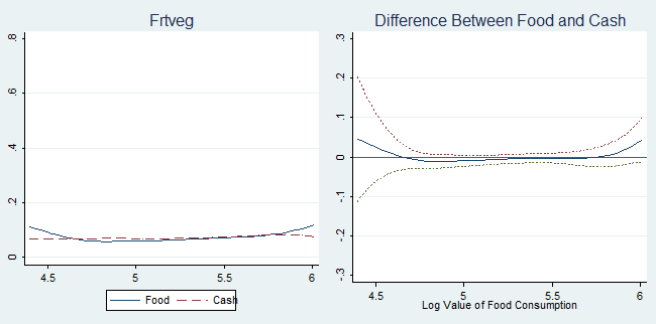


Figure 6. Food group Engel curves at endline, Yemen

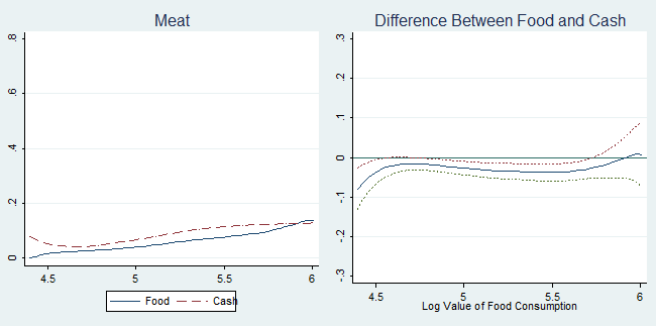
a. Starches and tubers



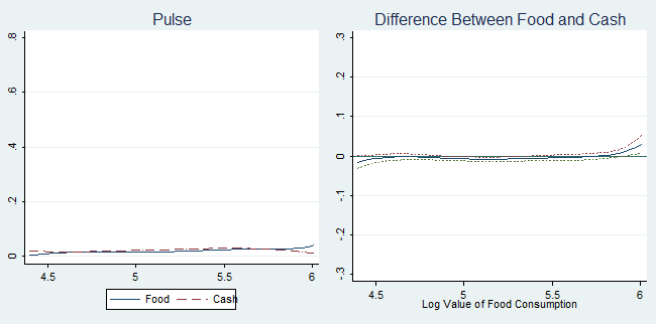
b. Fruits and vegetables



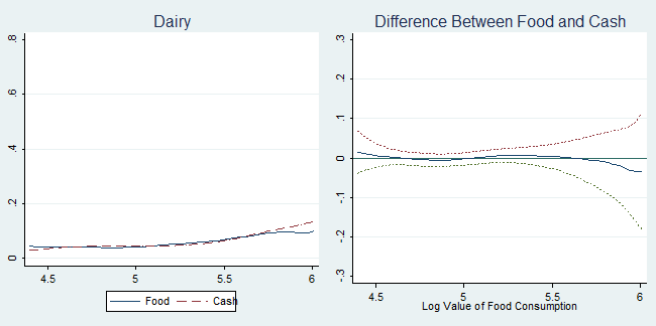
c. Meat, seafood, eggs



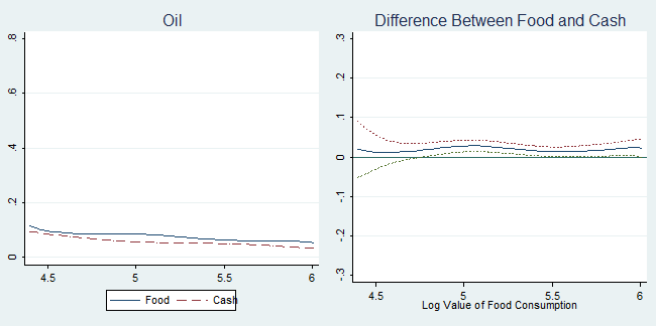
d. Pulses, legumes and nuts



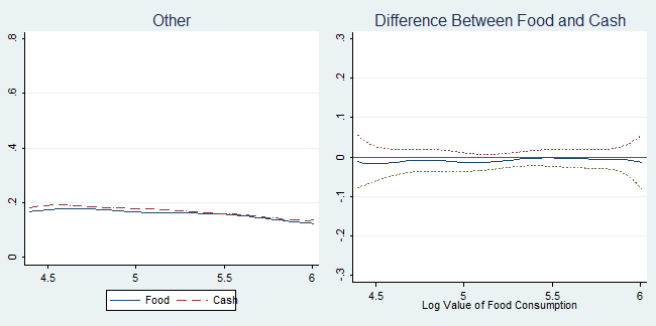
e. Dairy



f. Oils and fats



g. Other



X. Tables

Table 1. Summary of study design by country

	Ecuador	Uganda	Yemen
Intervention arms	Cash, food, voucher, control	Cash, food, control	Cash and food
Study setting	Urban	Rural, remote	Rural, remote
Target population	Columbian refugees and poor Ecuadorians	Households with children age 3-5 enrolled in informal preschools	Households most vulnerable to food insecurity (i.e. lowest scores on a proxy means test)
Transfer frequency and duration	6 monthly transfers	6 transfers occuring on a 6-8 week cycle	3 transfers on an approximately bimonthly basis
Value of transfer	$40 USD/month (equivalent to 10% of pre-transfer monthly household consumption)	25,500 UGX/transfer (about $10.25 USD; equivalent to 12.7% of pre-transfer monthly household consumption)	$49 USD/transfer (~37.5% of pre-transfer monthly HH consumption)
Sample size for evaluation (households)	Baseline: 2,357 Endline: 2,122	Baseline: 2,568 Endline: 2,461	Baseline: 1,983* Endline: 1,581 *Includes households dropped from analysis due to receiving transfer within 8 days of survey

Table 2. Baseline means of consumption shares by country

	Ecuador	Uganda	Yemen
Share of total consumption on:			
Food	0.395	0.821	0.563
	(0.007)	(0.003)	(0.250)
Health	0.073	0.046	0.113
	(0.003)	(0.002)	(0.189)
Education	0.233	0.008	0.023
	(0.006)	(0.001)	(0.036)
Other nonfood	0.299	0. 125	0.301
	(0.006)	(0.003)	(0.235)
Share of food consumption on:			
Starches and tubers	0.366	0.437	0.575
	(0.010)	(0.004)	(0.181)
Fruits and Veg	0.183	0.210	0.069
	(0.004)	(0.004)	(0.077)
Meat, seafood, eggs	0.206	0.054	0.061
	(0.005)	(0.002)	(0.091)
Pulses, legumes, nuts	0.029	0.148	0.022
	(0.001)	(0.003)	(0.039)
Dairy	0.073	0.013	0.042
	(0.003)	(0.001)	(0.076)
Oils and fats	0.003	0.050	0.061
	(0.000)	(0.002)	(0.073)
Other	0.141	0.088	0.170
	(0.003)	(0.003)	(0.111)
N	2,087	2,558	1,581

Notes: Standard errors in parenthesis are clustered at the cluster level.

Table 3: Baseline means by intervention arm, Ecuador

	Means				P-values of Difference in Means					
	Control	Food	Cash	Voucher	Food - Control	Cash - Control	Voucher - Control	Food - Cash	Food - Voucher	Cash - Voucher
Value of food consumption per adult equiv.	46.12	48.62	47.75	46.22	0.354	0.513	0.962	0.734	0.286	0.448
Value of total consumption per adult equiv.	137.86	144.63	140.98	137.46	0.493	0.695	0.954	0.709	0.426	0.606
Share of total consumption devoted to:										
Food	0.391	0.402	0.404	0.386	0.566	0.481	0.758	0.925	0.384	0.305
Health	0.067	0.073	0.081	0.070	0.577	0.102	0.731	0.423	0.762	0.157
Education	0.247	0.223	0.231	0.228	0.143	0.365	0.245	0.690	0.788	0.883
Other nonfood	0.295	0.301	0.283	0.316	0.681	0.412	0.223	0.219	0.419	0.049
Share of food consumption devoted to:										
Starches and tubers	0.360	0.380	0.376	0.351	0.550	0.561	0.735	0.901	0.362	0.324
Fruits and Veg	0.184	0.176	0.176	0.195	0.484	0.430	0.314	0.957	0.104	0.048
Meat, seafood, eggs	0.215	0.203	0.204	0.201	0.509	0.484	0.344	0.986	0.879	0.847
Pulses, legumes, nuts	0.030	0.028	0.028	0.029	0.593	0.620	0.728	0.936	0.755	0.804
Dairy	0.068	0.072	0.071	0.079	0.631	0.749	0.140	0.840	0.364	0.220
Oils and fats	0.003	0.003	0.002	0.002	0.719	0.382	0.360	0.261	0.247	0.976
Other	0.140	0.138	0.144	0.143	0.763	0.659	0.735	0.367	0.471	0.936

Notes: Number of observations is 2,087. Value of food consumption and total consumption is in US dollars. P-values are reported from tests on the equality of means for each variable. Standard errors are clustered at the cluster level.

Table 4: Baseline means by intervention arm, Uganda

	Means			P-values of Difference in Means		
	Control	Food	Cash	Food - Control	Cash - Control	Food – Cash
Value of food consumption per adult equiv.	37,655	46,101	33,906	0.552	0.334	0.389
Value of total consumption per adult equiv.	44,652	52,828	40,142	0.568	0.322	0.374
Share of total consumption devoted to:						
Food	0.814	0.813	0.840	0.976	0.116	0.160
Health	0.052	0.044	0.040	0.289	0.104	0.584
Education	0.008	0.008	0.008	0.905	0.975	0.936
Other nonfood	0.126	0.135	0.112	0.590	0.333	0.149
Share of food consumption devoted to:						
Starches and tubers	0.435	0.446	0.427	0.667	0.763	0.411
Fruits and Veg	0.206	0.198	0.229	0.709	0.336	0.128
Meat, seafood, eggs	0.060	0.056	0.050	0.639	0.259	0.467
Pulses, legumes, nuts	0.152	0.147	0.145	0.742	0.656	0.896
Dairy	0.014	0.013	0.011	0.783	0.450	0.625
Oils and fats	0.049	0.053	0.049	0.601	0.971	0.634
Other	0.085	0.088	0.090	0.812	0.649	0.908

Notes: Number of observations is 2,558. Value of food consumption and total consumption is in Uganda shillings. P-values are reported from tests on the equality of means for each variable. Standard errors are clustered at the cluster level.

Table 5: Impact of treatment arms on consumption, Ecuador

	Log food consumption (adult equiv)	Log total consumption (adult equiv)	Food share
Food treatment	0.287	0.207	0.029
	(0.055)***	(0.057)***	(0.019)
Cash treatment	0.218	0.154	0.028
	(0.046)***	(0.050)***	(0.015)*
Voucher treatment	0.240	0.162	0.023
	(0.045)***	(0.048)***	(0.013)*
R^2	0.04	0.05	0.04
N	2,111	2,111	2,111
P-value: Food=Voucher	0.35	0.41	0.72
P-value: Cash=Voucher	0.58	0.87	0.69
P-value: Food=Cash	0.17	0.35	0.96

Notes: Standard errors in parenthesis clustered at the cluster level. * p<0.1 ** p<0.05; *** p<0.01.
All estimations control for stratum.

Table 6: Impact of treatment arms on food group shares, Ecuador

	Starches & Tubers	Fruits & veg	Meat, seafood, eggs	Pulses, legumes, nuts	Dairy	Oils & fats	Other
Food treatment	-0.031	-0.007	0.032	0.016	0.004	-0.003	-0.011
	(0.011)***	(0.006)	(0.008)***	(0.004)***	(0.005)	(0.004)	(0.006)*
Cash treatment	-0.026	0.012	0.010	0.001	0.016	-0.007	-0.006
	(0.011)**	(0.007)*	(0.007)	(0.002)	(0.006)***	(0.003)**	(0.007)
Voucher treatment	-0.030	0.009	0.008	0.005	0.035	-0.008	-0.019
	(0.010)***	(0.006)	(0.006)	(0.003)*	(0.006)***	(0.003)**	(0.006)***
R^2	0.26	0.07	0.09	0.03	0.06	0.01	0.01
N	2,111	2,111	2,111	2,111	2,111	2,111	2,111
P-value: Food=Voucher	0.91	0.01	0.00	0.01	0.00	0.27	0.19
P-value: Cash=Voucher	0.58	0.65	0.77	0.09	0.00	0.70	0.06
P-value: Food=Cash	0.54	0.01	0.00	0.00	0.02	0.41	0.53

Notes: Standard errors in parenthesis clustered at the cluster level. * p<0.1 ** p<0.05; *** p<0.01.
All estimations control for stratum.

Table 7: Single-difference impacts of treatment arms on consumption, Uganda

	Food consumption (adult equiv)	Total consumption (adult equiv)	Food share
Food treatment	-0.022	-0.028	0.001
	(0.067)	(0.057)	(0.016)
Cash treatment	0.196	0.167	0.008
	(0.063)***	(0.055)***	(0.016)
R^2	0.051	0.058	0.041
N	2,357	2,357	2,357
P-value: Food=Cash	0.001	0.001	0.617

Notes: Standard errors in parentheses clustered at the ECD center level. * $p<0.1$ ** $p<0.05$ *** $p<0.01$.
Each cell represents a separate regression. All estimations control for stratum dummies.

Table 8: Single-difference impacts of treatment arms on food group shares, Uganda

	Starches & Tubers	Fruits & veg	Meat, seafood, eggs	Pulses, legumes, nuts	Dairy	Oils & fats	Other
Food treatment	0.007	0.003	-0.003	-0.006	0.000	0.006	-0.007
	(0.021)	(0.022)	(0.013)	(0.012)	(0.002)	(0.004)	(0.006)
Cash treatment	-0.033	-0.009	0.045	-0.006	0.006	0.002	-0.005
	(0.021)	(0.022)	(0.012)***	(0.014)	(0.002)***	(0.003)	(0.005)
R^2	0.055	0.053	0.037	0.015	0.040	0.039	0.007
N	2,357	2,357	2,357	2,357	2,357	2,357	2,357
P-value: Food=Cash	0.040	0.569	0.000	0.991	0.005	0.379	0.731

Notes: Standard errors in parentheses clustered at the ECD center level. * $p<0.1$ ** $p<0.05$; *** $p<0.01$.
Each cell represents a separate regression. All estimations control for stratum dummies.

Table 9: Relative impact of food and cash transfers on consumption, Yemen

	Food Consumption	Total Consumption	Food Share
Food	-0.013	-0.013	-0.010
	(0.049)	(0.046)	(0.020)
N	1,581	1,581	1,581

Notes: Standard errors in parenthesis clustered at the FDP level. * $p<0.1$ ** $p<0.05$; *** $p<0.01$. All estimates control for district fixed effects
Dependent variables in columns (1) & (2) calculated as log value per adult equivalent.
Excludes those who received transfers within 8 days of the survey

Table 10: Relative impact of food and cash transfers on food group consumption shares, Yemen

	Starches	Fruit & veg	Meat, seafood & eggs	Pulses, legumes, nuts	Dairy	Oils & fats	Other
Food	0.024	-0.002	-0.026	-0.004	-0.011	0.018	0.002
	(0.016)	(0.005)	(0.008)***	(0.002)*	(0.019)	(0.008)**	(0.007)
N	1,581	1,581	1,581	1,581	1,581	1,581	1,581

Notes: Standard errors in parenthesis clustered at the FDP level. * $p<0.1$ ** $p<0.05$; *** $p<0.01$. All estimates control for district fixed effects
Food group shares calculated as proportion of value of total food consumption per adult equivalent.
Excludes those who received transfers within 8 days of the survey

Table 11: Impacts of treatment arms on consumption by sex of household head at baseline, Ecuador

	Log food consumption (adult equiv)	Log total consumption (adult equiv)	Food share
Food treatment	0.244	0.188	0.019
	(0.059)***	(0.057)***	(0.020)
Cash treatment	0.200	0.155	0.022
	(0.053)***	(0.055)***	(0.017)
Voucher treatment	0.237	0.175	0.014
	(0.049)***	(0.051)***	(0.014)
Food X Female headed households	0.242	0.103	0.058
	(0.100)**	(0.087)	(0.030)*
Cash X Female headed households	0.065	-0.046	0.036
	(0.091)	(0.084)	(0.025)
Voucher X Female headed households	-0.002	-0.098	0.050
	(0.093)	(0.078)	(0.027)*
Female headed household	0.100	0.211	-0.046
	(0.072)	(0.058)***	(0.019)**
Constant	3.590	4.427	0.478
	(0.049)***	(0.045)***	(0.016)***
R^2	0.05	0.07	0.04
N	2,111	2,111	2,111
P-value: Food=Voucher	0.89	0.81	0.78
P-value: Cash=Voucher	0.39	0.69	0.56
P-value: Food=Cash	0.41	0.55	0.87

Notes: Standard errors in parenthesis clustered at the cluster level. * $p<0.1$ ** $p<0.05$; *** $p<0.01$.
All estimations control for stratum.

Table 12: Impacts of treatment arms on consumption by sex of household head at baseline, Uganda

	Food consumption (adult equiv)	Total consumption (adult equiv)	Food share
Food treatment	-0.012	-0.013	-0.001
	(0.068)	(0.059)	(0.016)
Cash treatment	0.187	0.164	0.005
	(0.063)***	(0.056)***	(0.017)
Food x Female headed households	-0.174	-0.242	0.027
	(0.202)	(0.153)	(0.045)
Cash x Female headed households	0.141	0.059	0.045
	(0.220)	(0.181)	(0.040)
Female headed households	0.006	0.057	-0.028
	(0.169)	(0.128)	(0.034)
R^2	0.054	0.062	0.042
N	2,357	2,357	2,357
P-value: Food=Cash	0.003	0.002	0.679

Notes: Standard errors in parentheses clustered at the ECD center level. * $p<0.1$ ** $p<0.05$ *** $p<0.01$.
Each cell represents a separate regression. All estimations control for stratum dummies and a dummy for missing information on sex of head.

Table 13: Relative impact of food and cash transfers on consumption by sex of household head at baseline, Yemen

	Food Consumption	Total Consumption	Food Share
Food	-0.030	-0.010	-0.022
	(0.051)	(0.047)	(0.019)
Food X Female headed households	0.129	-0.019	0.094
	(0.090)	(0.096)	(0.036)***
Female headed households	0.016	-0.039	0.033
	(0.066)	(0.072)	(0.029)
N	1,581	1,581	1,581

Notes: Standard errors in parenthesis clustered at the FDP level. * $p<0.1$ ** $p<0.05$; *** $p<0.01$.
All estimates control for district fixed effects.
Excludes those who received transfers within 8 days of the survey