DOES FOOD AID DISRUPT LOCAL FOOD MARKET?

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Abstract

This paper analyses empirically the impact of food aid on production, sales and purchases. We estimate the discrete choice and the level choice using the Ethiopian rural household survey. The panel dimension allows us to deal with food aid selection. Running a panel Tobit with sample selection and endogeneity we find that food aid reduces the probability of being a producer. It increases the one of being a seller and decreases the one of being a buyer only after 2004 that corresponds to changes in the criteria of food aid allocation. Food aid does not affect the level choice.

KeyWords

Food aid, production, sales, purchases, Ethiopia

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1. Introduction

Among the many policies that are aiming at food security, food aid obviously stands as a direct and powerful instrument. However, its impact on agricultural production and on food sales and purchases is still unclear. Food aid could harm production by decreasing prices and induce some shift from one crop to another (Schultz, 1960). Empirical evidence is mixed; studies relying on aggregate data has found strong disincentive effects (Mann, 1967; Isenman and Singer, 1977), while work based on household surveys have tended to find the opposite (Lowder, 2004; Abdulai et al., 2005). Abdulai et al. (2005) show that once one controls properly for endogeneity of food aid allocation there is no empirical support that food aid creates disincentive effects at the household level and at the macro level. Furthermore they find some suggestive evidence of potential positive effects of food aid.

Three reasons might explain this lack of clear evidence. First, there is a selection issue, as food aid is targeting some households who could be specific in terms of production and reliance on markets. Second, there could be some reverse causality if aid is given to a household based on current harvest. Third, most previous studies have looked at the impact of food aid at the intensive margin (that is, its impact on quantities) but not at the extensive margin, namely, how it determines whether a household would produce, sell or buy a given crop. Indeed food aid might affect not only production but also their market participation behavior, as recipient households might start selling their produce or stop buying the crop. This idea was first raised theoretically by Khatkhate (1962). To our knowledge only one working paper from Yamano et al. (2000) looks at the impact of food aid on buying and selling decisions through income effect; however, the paper does not take into account the endogeneity of aid.

In this paper we consider heterogeneous households, who differ in how they participate into markets. A given household may be growing a crop for its own consumption only (and wil be labelled "autarkic") or selling part of it (hence, a "seller"). It could also buy the crop on the market (a "buyer") or not producing nor consuming the crop at all ("non-involved"). Using a panel dataset on Ethiopia, one of the main aid recipient for many years [1], we document these different types of households. We also observe that households change the type of market participation over time, a shift that might be correlated to their receiving aid. I look at the impact of food aid at the extensive margin (on the choice of the type of market participation) and at the intensive margin (on the quantities). We focus on wheat, which is the main crop distributed through aid and the third crop cultivated in Ethiopia.[2]

I use the Ethiopian rural household survey (ERHS) between 1994 and 2009. The panel structure of the data allows to treat the problem of selection, as unobservable household characteristics that might explain why some of them receive food aid are taken into account by the longitudinal dimension. We estimate the impact of food aid on production, using a panel Tobit with selection and endogeneity (Semykina and Wooldridge, 2010). We need an exclusion variable, that might explains the choice of producing wheat but not the level of production. As an exclusion variable, we choose the share of religious holidays during the planting season. Next, we also estimate the impact of food aid on commercialization decisions. We model separately selling and buying decisions and we allow food aid to impact the extensive and the intensive margins differently.

We find that food aid has a significant negative impact on the choice of producing, hence on the number of producers. The average quantity of food aid in wheat received between 1994 and

[1] In 2004, Ethiopia was the second largest recipient of food aid in the world according to INTERFAIS - World Food Program and was the first from 2008 to 2011. About 5 millions live in food insecurity, especially in rural zones.

[2] In 1999, the amount of wheat distributed in Ethiopia was equal to domestic production.

2009 decreases the probability of being a wheat producer by 3% on average. However, aid has no impact on the quantities produced. These result might explain the apparent contradiction between macro level studies which found a decrease in domestic production due to aid and studies at the micro level which found no impact. On the decisions on sale and purchase, we observe a shift in 2004, when the Ethopian government implemented the Productive Safety Net Program (PNSP) and changed the rules of free food aid allocation. After 2004, food aid increases the probability of selling wheat. Moreover, in 2004, food aid also reduces the probability of buying wheat. At the intensive margin, food aid has no impact on quantities. Thus, food aid in Ethiopa is not additional and seems even less so at the outset of the 2004 reform in the allocation criteria, perhaps temporarily.

The remainder of the paper is structured as follows. Section 2 sets the context of food aid in Ethiopia and describes households heterogeneity with respect to market participation. In section 3, we present the empirical framework that estimates the impact of food aid on households and how we deal with reverse causality and selection. Section 4 discusses the empirical results. Finally section 5 concludes.

2. Context and Data

2.1. Food Aid in Ethiopia

Ethiopia has been one of the major food aid recipients for decades. Over the last 20 years, food aid in Ethiopia has been equivalent to 10 percent of national production (Planel, 2005) in good years and even 20 percent in war or drought years. In 2003, Ethiopia threw a huge effort, the Productive Safety Net Program (PNSP) in collaboration with donor countries in order to reduce food insecurity and hunger. The program has provided food-for-work for enabled people, targeted direct transfers for households who cannot work and protected assets in emergency situation; in some cases it has also provided direct support. This program was restricted between January to June in order not to interfere with farming activities. However the implementation of the PSNP suffers some problems such as payment delays or regional differences (Hoddinott et al., 2012).

Food aid is distributed across regions and weredas (sort of district) by the government.[3] In mid-September, after the rainy season (meher), the Ethiopian government estimates the number of households likely to be in need in the following year and their localization and computes the level of needs by woreda. The government then calls for food aid pledges by international donors in December, in the middle of the meher harvest. Next food aid is distributed every month at the national level, even if some areas may receive it only during a few months. Nevertheless Clay et al. (1999) and Enten (2008) showed that the determinants of food aid allocation at the woreda level are due to a process of negotiations between government, administrative staff and local people but not linked with real needs. In rural areas, woreda committees allocate food to Peasant Associations (PA). PA leaders prepare a list of beneficiary households and distribution is carried out by members of the PA. These leaders are officially elected through "free and fair" elections but in practice there are manipulation and menaces (Watch, 2010). Rural households tend to vote for the current leader who generally belongs to the majority party in order to avoid repression or exclusion to federal support programs. In consequence rural votes have been largely in favor of the ruling national coalition for many years without any significant changes. Connection to leaders are thus important to be beneficiary households.

[3] A woreda is composed by kebeles (group of villages) and peasant associations. In order to obtain land, households have to register with the PA which keeps the list of recipient households. A peasant association can cover many villages. For instance, the Adele Keke PA consists of 28 villages.

In addition the criteria of food aid allocation have changed in 2003. Before 2003 the groups that are mentioned to be eligible to special assistance are the old, the disabled, lactating and pregnant women, and persons who are required to attend to young children. An official guideline, revised in 2003, explains how to allocate food to the neediest households following the Household Economic Approach. Hence, actual targeting criteria are quite obscure and more easily manipulable. Actually, only 22 percent of the food insecure people receive food aid either because the district they live in, was not targeted or because the household was not selected in a targeted district. In parallel the Ethiopian government launched a large safety net program in 2003-2004 : the Productive Safety Net Program (PSNP) which is a large food-for-work program.The idea was to switch from free food aid to food-for-work aid.

2.2. Ethiopian Rural Household Survey

The data is a longitudinal survey which covers around 1 500 households in 18 villages in rural Ethiopia from 1994 to 2009.Villages are selected so as to account for the diversity in the farming systems of the country. Thus data are not nationally representative but the sampling frame allow to consider it as broadly representative of households in non-pastoral farming systems as of 1994 (Dercon and Hoddinott, 2004). Each village is located in a peasant association (PA) except four which are in the same peasant association. The survey gives households' characteristics, agriculture and livestock information, consumption, transfers and remittances, health, women's activities and food aid transfers as well as information at the village level. Here we focus on surveys done in 1994, 1995, 1999, 2004 and 2009.[4]

The variables of interest are whether the household has received food aid or food-for-work and the quantities the household has received. We pool free food aid and food-for-work for two reasons. The first is to get a higher number of beneficiaries in order to detect the impact of food aid. We do not have enough power to distinguish precisely the impact of each aid type for each year. The second is that in principle the targeted population is not completely the same for both channels of food distributions. It is important to consider all households who depend on food relief when one wants to look at potential disincentive effects. For simplicity, we focus on one crop, wheat, which is one of the major cereals in Ethiopia. Since the mid-1990s, wheat consumption is steadily increasing both in urban and rural areas. Wheat is one of the priority strategic crops for solving food security challenges in the country (Tefera, 2012). In addition a large share of food aid is provided in wheat. In the sample, 74 percent of food recipients get wheat.

Table .9 provides descriptive statistics for each round. There is a large variability on food aid recipients. Indeed in 1995 only seven percent of households have received free food aid whereas there were almost 30 percent in 2009. The share of household benefiting from food-for-work programs was stable during the 90s at around 10-11 percent but it fluctuates after 2000 with a large increase in 2004 (22 percent of households) and a large decrease in 2009 (5 percent). The year 2004 corresponds to the end of a drought and the beginning of the implementation of the PSNP that could explain a higher share of households receiving food-for-work. In addition the quantity received by household is highly variable: from 30 kilograms per household in 1995 to 100 kilograms per household in 1999. The latter is the year when households received the most food aid whereas we do not observe a simultaneous decrease in production. There is also a large

[4]I drop the second round as the reference period is six months instead of one year in order to maintain coherent figures on production and consumption data. We also drop the fourth round which surveyed additional villages and focused on productivity that drives to changes on the questionnaire. The sixth wave, in 2004, occurred just after two major changes on food aid policy in Ethiopia. The Ethiopian government published a new guideline for food aid distribution based on an economic household analysis (DRMFSS, 2003) and implemented the PSNP.

variability across villages : the share of recipient households varies from zero percent to almost 80 percent depending on the year and the village. The relatively small number of villages limits our ability to describe the impact of food aid on production at the village level but the large random samples within villages allow to estimate the impact of food aid within villages. Panel structure will allow to control for unobserved fixed heterogeneity in food aid distribution.

2.3. Market Participation Choice and Food Aid

I define four types of market participation regarding wheat. Households can be non-involved: they neither produce nor buy wheat. Or they can be producers, or buyers or sellers. Types are in gross terms. It means that it can have some overlapping even if the share of households which are both wheat buyer and wheat seller is really small (around two percent). Producers include households that sow even if they get no harvest for any reason. All types of market participation - buyer, seller, autarkic and non-involved - exist in Ethiopia. The exception is 1995, when there are no autarkic households. The share of households that cultivate wheat increases over time. In 2009, 55% of households are non-involved in wheat, 32% produce wheat, 10.04 percent were seller and 15.96 percent were buyers; 19.83 were in autarky. Market status is not stable across rounds. Substitution seems to happen over time mostly between buyers and non-involved households and on a lesser extent between seller and autarkic households. Being a seller appears to be the most stable status.

In the descriptive statistics, food aid recipients differ from other households in terms of their market status. Table 1 suggests that recipient households are more likely to be non-involved households. They also produce less. The differences could suggest that food aid has an impact both on the choice of producing, buying or selling wheat and on the quantities produced and exchanged. Nevertheless we cannot neglect the effect of selection of recipient households. Looking at targeting criteria, recipient households' size is smaller and include older people. They have on average fewer children, though we would have expected the opposite given the official allocation guidelines before 2004. Food-for-work and free food aid recipients seem to be different in terms of agricultural assets and household composition. Households receiving free food aid are smaller than households receiving food-for-work but host more old people. Food-for-work households, as expected, cultivate less land than other households and have less livestock.

3. Empirical Specification

3.1. On Production

We model simultaneously the production decision and the quantity produced. We allow food aid to affect both stages differently. We run a panel Tobit type II with selection and endogeneity (Semykina and Wooldridge, 2010). The model is defined by :

$$\begin{aligned} y_{it} &= y_{it}^* * s_{it} \\ s_{it} &= \mathbb{1}_{s_{it}^*>0} \\ y_{it}^* &= x_{it}\beta + \gamma_1 FA_{it} + c_{i1} + u_{it1} \\ s_{it}^* &= x_{it}\beta_{2t} + z_{it}\delta_t + \gamma_{2t} FA_{it} + c_{i2} + u_{it2} \end{aligned} \tag{1}$$

where y_{it} is the quantity of wheat produced in one year t by a household i and y_{it} is the decision to produce both observed if s_{it}^*, the latent variable that drives production decision, is higher than 0. y_{it}^* is the latent variable that drives the level of production. FA_{it} is the quantity of wheat aid received in the last 12 months (through free food distribution and/or food-for-work programs) by each household. For both stages, if food aid is well targeted we should expect no effect on the

Table 1: Market participation status, Average Wheat Production and Average Wheat Sales and Purchases (in kg) depending on whether a household receives wheat aid

	No Food Aid	Food Aid	Difference
Seller			
Participation	16.22%	6.03%	***
Production (in kg)	529.08 (544.79)	402.85 (396.11)	**
Sales (in kg)	249.42 (294.93)	197.39 (200.19)	**
Buyer			
Participation	18.18%	16.05%	
Production (in kg)	55.65 (170.34)	31.27 (103.88)	**
Purchases (in kg)	58.42 (236.24)	64.34 (93.19)	
Autarkic			
Participation	12.67%	4.90%	***
Production (in kg)	308.80 (301.01)	141.21 (141.09)	***
Non-involved			
Participation	54.42%	74.33%	***

Note: All rounds are pooled. Standard Deviations are in parenthesis. For each market participation regime, we test whether the means are equal between non beneficiaries and beneficiaries of wheat aid.

decision to produce nor on the quantities. We allow control variables, x_{it}, to affect differently both levels of decisions.

Control variables are meant to capture market conditions and transactions costs: whether there is a daily market within the peasant association, distance to the nearest market and regional dummies. We also add consumption and production shifters such as household size (per adult equivalent), the age of the household's head (as it could affect the productivity), whether the household is poor, the amount of non-food consumption, livestock size (in tropical livestock units) and the area of cultivated plot in hectares. The household size takes into account the fact that larger families can allocate more labor on their plots. The size of the livestock matter in two ways for cereals production: first, part of the harvest is used to feed the livestock; second, manure is used as a fertilizer and may improve harvest. Poor households may invest less on agriculture because they are cash constrained; they may also cultivate less risky hence often less productive crops in order to reduce risks. We also include the share of women, children and old people within the household in order to control for observable characteristics which could explain food aid allocation, affect productivity and demand for food. Finally we control for climatic shocks, by including a dummy which is equal to one if the household declares that rains did not come in time during the growing season. We also take into account health shocks, namely, whether one member of the household was sick during the previous month. We cannot control for health shocks that happen during the growing season but we could expect that actual illness is a good proxy for previous bad health.

The estimation procedure is as follows. For each round, we estimate

$$\mathbb{P}\left(s_{it}=1|z_i\right)=\Phi\left(z_{it}\delta_t^a+\gamma_{2t}FA_{it}+\overline{z}_i\xi_t^a+\overline{FA}_i\xi_{2t}^a\right)$$

with $\overline{z}_i$ is the individual mean over time of z_{it} and $\overline{FA}_i$ the average quantity of food aid received by household i over time. Next, we compute the inverse Mills ratio, $\hat{\lambda}_{it}$. For $s_{it}=1$ we estimate a pooled two stage least square with $y_{it}^*=x_{it}\beta+\overline{z}_i\nu+\gamma\hat{\lambda}_{it}+e_{it}$ using 1, z_{it1}, $\hat{\lambda}_{it}$ and $\overline{z}_i$ as instruments where z_{it1} represents variables included in z_{it} but not in x_{it}. Finally we estimate the variance applying a panel bootstrap.

Three issues arise with this type of estimation : endogeneity of food aid allocation, reverse causality and the need to have an exclusion variable that differentiate between the decision to produce and the level of production.

First, on the issue of selection. The distribution of food aid is not random only because of targeting. We exploit the panel nature of the data in order to control for fixed heterogeneity in the distribution of food aid. In doing so, we assume that endogeneity is conditional on the unobserved household effect, c_{i2}, only through the time averages of the variables. This is a reasonable assumption, because the institutional setting of food aid allocation as presented previously has not changed much as well as the political party of PA leaders who are ultimately allocating aid to a given household. We assume implicitly that PA leaders will favour the same households and do not favour some households just before the elections and other just after elections for instance.

The equations above relate food aid received by a household in year t to its production during the same year. Actually, food aid is mostly distributed during the lean season between April and September. It is also during these precise months that households decide what to produce during the main harvest (meher), which starts in October and goes through December. Normally, there is no aid distributed during the meher harvest.[5] There is also a minor harvest in May and June (*belg*).[6] The meher rain in June and July is a good predictor of the meher harvest to come and food aid could be adjusted accordingly. However, the amount of aid are not revised before August and due to usual delays, actual quantities given to households start to be affected only in September and after January. Hence, because of this timing, it seems that the concern of reverse causality, that is, that the quantity of food aid received in year t might depend on the level of production in year t, can be ruled out. Moreover, it is also reasonable to examine the impact of aid received on the production of the same year, and safely ignore any lagged impact on following year's harvest.

For our estimation strategy to hold, we need an excluding variable that would explain the decision to produce but not the level of production. We choose as such excluding variable, the share of religious holidays during the planting and growing seasons depending on the religious group in which a household belongs. Our argument is that different religious groups have different preferences and production choices. Some prohibitions (such as dairy products for Orthodox Christian) may favour the production of alternative products. In choosing this variable, we rely on Kijima and Gonzalez (2013) who find that religion does not affect agricultural productivity but the choice of crops (hence, producing wheat or not).[7] Table 2 shows the expected probability of being a wheat producer depending on their religious group and the share of off days during planting and sowing (controlling for other household's characteristics). The probability differs across religious groups and decreases with the share of off-days.[8]

3.2. On Sales and Purchases

We use the same Tobit specification for sales and purchases. However, it is harder to find a variable that might explain the decision to sell or buy and not the quantities. Hence, we just rely for identification on the non linearity of the inverse Mill ratio. However, we will present later

[5] In case of delays we could expect some marginal distribution. We have no hint that confirm these types of distribution.

[6] Wheat is not produced during this minor harvest.

[7] Religious off days are for instance, Easter, Pentecost, Holy Friday and the Ascension for Catholic, Ramadan for Muslim; we also add civil holidays for all groups.

[8] The share of religious holidays varies every year and by region because the growing season is not exactly the same in each region and the day of religious holidays changes every year.

Table 2: Probability of being a wheat producer depending on the share of religious holidays

	Less than 1%	Between 1 and 5%	More than 5%	(1) - (2) = 0	(2) - (3) = 0
Orthodox	0,536	0,242	0,329	***	***
Muslim	0,193	0,103	0,096	***	
Protestant	0,682	0,007	0,009	***	*
Other religions	0,571	0,05	No obs	***	N.A

Expected probability of being a wheat producer is computed from a probit that control for round and regional effect, household's characteristics (except religion) and market conditions.

a robustness check with the same excluding variable that we have used for production. Besides food aid, selling and buying decisions may be driven by characteristics related to production and market conditions. Pender and Alemu (2007) finds that a rise in the production of maize and teff results in rise in sales. Hence, we control for the quantity of cereals produced. As some households may be self-sufficient in food even though they do not grow wheat (because they rely on other crops), we control for the total area cultivated by the household. As a proxy for market opportunities, we take distance to the nearest market and the frequency of the local market. We expect these latter variables to have a smaller impact on buyers than on sellers, as buyers are more constrained. Distance and transport cost may also affect the quantities that are sold or bought. We control price level with a food price index computed at the village level. It is immune to reverse causality because it is not the price of wheat. We also add households' characteristics such as household size and composition, their poverty status (as wheat is more expensive than other crops) and non-food expenditures as a proxy for wealth. Household size may work in both ways : having a large family may facilitate sales but it also increase the demand for food and the need to buy. We also control for climatic shocks and health shocks, as the household many need cash in order to buy medicine if someone is sick.

4. Results and Analysis

4.1. On Production

Table 3 shows the results of the estimation of the production system. It reports how many times a variable has a positive or a negative impact on the probability of producing wheat, and how many times the estimate is statistically significant. The average quantity of food aid received between 1994 and 2009 has a negative and statistically significant impact on the probability of being a producer. Thus food aid, once controlled for its endogeneous allocation, is shown to reduce the number of producers. An 10 kg increase in food aid for each round reduces the probability of being a producer by 3% at each round. Current food aid has no impact on the decision to produce, except once, in 1994 where it reduced the probability of growing wheat. In 1994, a 10 kg increase in food aid (for an average of 150 kg per year and households) reduces the probability of being a producer by 6%. Turning now to the quantities produced, food aid is shown to have no significant impact, even if the sign is negative as expected (see table 4).

That food aid has different effects on the decision to produce and on the level of production could help explain why some macro papers have found a decrease in production due to food aid (Lavy, 1990) while no impact showed up in micro studies (Abdulai et al., 2005). Overall, these results suggest that food aid is not perfectly additional, probably because of poor targeting. However, one cannot infer from these results that food security of recipient households has not improved. They have received wheat for their consumption, possibly with better nutritional

standards.[9] They have stopped growing wheat and could have started growing another crop.

The excluding variables explain the decision of producing wheat. The share of off days during the sowing season has a significant impact but the sign is not constant over time. It could be due to the fact that in 2004 and 2009 (the year for which the effect is positive) there are no differences in the share of religious holidays between Muslim and other religious groups. There are also differences in the quantities produced between religious groups, with Orthodox Christian producing the most. Finally market conditions affect production decisions at both margins. Living far from the nearest market increases the probability of growing wheat and the quantities produced. Having a market one day more within the peasant association increases wheat production.

Table 3: Determinants of Wheat Production: discrete choice, Panel Tobit Type 2 Estimation

	+ / -
Wheat Aid (in kg)	0(2)/1(3)
Average wheat aid over rounds (kg)	0(0)/3(5)
Religion (ref. Orthodox Christian)	
Protestant	3(4)/1(1)
Muslim	0(2)/3(3)
Other religions	4(5)/0(0)
Share of off days during planting season	2(2)/1(3)
Additional controls	Yes
Average characteristics	Yes

[a]: Omitted in one regression due to collinearity. Lecture: The average quantity of wheat aid received by a household over the five rounds decreases the probability of being a wheat producer five times and significantly four times.

Table 4: Determinants of Wheat Production: quantities, panel Tobit type 2 estimation

Variables	Estimate	Sd.E.
Wheat aid (in kg)	-0.601	(0.543)
Region and round Fixed effects	Yes	
Additional controls	Yes	
Number of obs	1,691	
R-squared	0.39	
Number of bootstrap rep.	999	

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Instruments: Share of off days, religion, average household variables, inverse Mill ratio. All rounds are pooled together. Controls include: land area, livestock, rain shock, health shock, household size, household head age, share of women, non food expenditure, poor dummy, distance to the market, periodicity of the market and regional dummies.

4.2. On Sales and Purchases

Being a seller and level of sales

Selling decisions are estimated on a smaller sample of wheat producers (which makes around 350 observations for each round except in 2009 where there are 629 observations). It could affect the precision of estimates. The impact of food aid changes over time (table 5). The sign of the impact shifts in 2004 : before that year, the impact is negative (and statistically non-significant); in 2004 and again in 2009, the impact is positive and significant. For instance in 2009, ten additional kilograms of food aid increase the probability of selling by 3%, which is relatively important compared to the impact of cultivating one more hectare the same year. This could be related to 2004 being the starting year of the PNSP, which saw a large increase in the number of aid recipients, perhaps at the expense of the quality of targeting. When we disentangle food aid between between food-for-work and free transfer, we find that it is the latter that explains most of the shift. Hence, in 2004, some households for whom aid was not additional actually received it. Control variables are in line with expectations : the decision to sell is positively correlated with higher production, better market conditions and a higher food price.

I find no impact of food aid on the level of sales (table 6). Cereal production has a statistically significant impact on the level of wheat sales. When cereal production increases by 100 kilograms, households sell 16 additional kilograms of wheat; this ratio should be higher if we

[9]Nutritional standards imposed by the WFP for instance are high.

Table 5: Determinants of Wheat Selling: discrete choice, Panel Tobit Type 2 Estimation

	+/-
Food aid in wheat (kg)[a]	1(2)/0(2)
Average food aid in wheat (kg) over time	0(1)/1(3)
Cereal production (kg)	3(4)/0(1)
Market - No. Of days per week within PA[b]	4(4)/0(0)
Additional controls	Yes
Average characteristics	Yes

[a] : variable predict success perfectly for one or two rounds.
[b] : due to convergence failure, this variable was dropped in 1995.

Controls include: land area, livestock, rain shock, health shock, household size, household head age, share of women, children and old people, non food expenditure, poor dummy, distance to the market, FPI and regional dummies.

Table 6: Determinants of Wheat Sales: quantity

Variables	Estimate	Sd.E.
Wheat aid	-0.765	(4.722)
Cereal production	0.166	(0.039)***
Cultivated area	-24.406	(25.235)
Additional controls	Yes	
Number of obs	915	
R-squared	0.04	
Number of bootstrap rep	999	

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Instruments: average individual variables, inverse Mill ratio. Controls include: land area, livestock, rain shock, health shock, household size, household head age, share of women, children and old people, non food expenditure, poor dummy, distance to the market, periodicity of the market, FPI and regional dummies.

focus on wheat production only. The size of livestock has a negative impact on the quantities of wheat sold. Other factors that affect household demand have non significant impacts.

Being a buyer and level of purchases

The impact of food aid on the decision to buy also switches in 2004 (table 7). Before 2004, the impact of aid is positive but not statistically significant. Afterwards, the impact turns negative, but it is significant only in 2004, when increasing food aid by 10 kilograms reduces the probability of being a buyer by 0.004. When we disaggregate by types of aid, it appears that the shift is driven by food-for-work. One explanation is that the PNSP was not perfectly implemented at the beginning (Hoddinott et al., 2012): households received too much quantities of food aid or with delay, so that food aid was no longer additional.

As for other determinants of the decision to buy, being poor reduces the probability of buying and market conditions matter but in a somewhat non intuitive way. The decision to buy increases with distance and decreases with the frequency of the local market. The latter effect may come from the survey design. As households are asked to report all the purchases they made during the previous month, they could omit to report more easily some of them if they go buy small quantities very frequently to a market close by and could also explain why we observe a positive effect (but non significant) at the quantities level.

Food aid does not affect the quantities that are bought (table 8). What matters is household composition : having more women in the household increases the purchases, as well as regional differences : living in Tigray, a food insecure region with low and volatile agricultural production, results in larger quantities purchased.

4.3. Robustness Checks

In order to test the robustness of our results, we run several regressions. First, we do not restrict the panel to be balanced. We also take food aid in all crops and not only wheat, as

Table 7: Determinants of Wheat Buying: discrete choice, Panel Tobit Type 2 Estimation

	+ / -
Food aid in wheat (kg)	0(3) / 1(2)
Average food aid in wheat (kg)[a]	0(3)/0(1)
Household size	0(4) / 0(1)
Poor dummy	0(0) / 5(5)
Market - No. Of days per week	0(1)/4(4)
Log(distance to the closest market)	3(4)/0(1)
Average characteristics	Yes
Additional controls	Yes

[a] : due to collinearity, this variable was dropped in 1999. Controls include: land area, livestock, rain shock, health shock,household head age, share of women, children and old people, non food expenditure, FPI and regional dummies.

Table 8: Determinants of Wheat Purchases: quantity, panel Tobit type 2 estimation

Variables	Estimate	Sd.E.
Wheat aid	-0.160	(2.139)
Additional controls	Yes	
Number of obs.	1,196	
R-squared	0.01	
Number of bootstrap rep.	999	

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Instruments: Wheat cultivation dummy, livestock (TLU), average individual variables, inverse Mill ratio. Controls include: land area, livestock, rain shock, health shock, household size and head age, share of women, children and old people, non food expenditure, poor dummy, distance to the market, periodicity of the market, FPI and regional dummies.

the explanatory variable : results remain similar. For the production equations, we use the household's religious group and the share of religious holidays as excluding variables. Thus the first stage equation do not change but religion cannot affect anymore the quantities produced by a household.

For selling and buying decisions we redo the estimation when the panel is unbalanced and we consider food aid in all crops. We also use excluding variables that would explain the decision to buy (or sell) but not the quantities, and we take livestock owned and religion. Some religious groups could rely easier on markets because they would have more networks. Household with large livestock may prefer selling some animals rather than wheat. Finally we replace the food price index by unit values for wheat. Indeed in 2009, there was a discrepancy between the food price index and households' unit values computed as the ratio between the value of purchases (or sales) and the quantities in kilograms. Unit values remained at the same level as in 2004 whereas the price index was multiplied by three. It is likely that households, faced with higher prices, have turned to lower quality wheat in 2009. Results remain the same.

Overall results are robust to the specification. Food aid reduces the probability of producing wheat in all years and after 2004, also reduces the probability of selling or buying wheat, without significant impact on quantities.

5. Conclusion

This paper examines the impact of food aid on households' production, sale and purchase of wheat in Ethiopia, a major aid receiver. The framework models households' decisions, not only on quantities (at the intensive margin), but also on the degree of their market participation (at the extensive margin). The endogeneity of aid is dealt with the inclusion of observable household characteristics, based on the actual allocation procedures in Ethiopia and using the panel structure of the data in order to account for unobservable households characteristics. Food aid is shown to impact the extensive margin. It reduces the probability of producing wheat, but the size of the effect is rather small. After 2004, it increases the number of sellers and decreases the number of buyers. Hence, food aid might be one reason why households in Ethiopia have changed their market participation over the years. However, food aid has no impact at the intensive margin, on quantities.

The shift in 2004 is simultaneous to the introduction of new guidelines for food aid allocation and the start of the PSNP which extended the number of food aid recipients. The impact on the number of sellers comes mostly from food-for-work, while the impact on the number of

buyers come from households receiving free food aid, suggesting a deterioration of targeting in the first years of the new program.

Market conditions also matter: improving market access (distance to the nearest market and its frequency) and investing on production infrastructure (such as storage) are important in order to promote commercialization.

Hence, in the case of Ethiopia, concerns of a possible large negative impact of food aid on local production and markets are probably not relevant. The results suggest that the new guidelines of aid allocation should be carefully evaluated, not only based on their economic principles, but also taking into account their actual implementation in the institutional context of Ethiopia. The sophistication of the criteria could lead them to appear as a kind of black box, that could be manipulated by people in charge of aid allocation. Moreover, factors that could improve food distribution such as better road and storage facilities, could also improve market access and change households participation to markets.

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Table .9: Descriptive statistics for each round

	1994		1995		1999		2004		2009	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Poor (%)	48.23	*49.98*	55.19	*49.75*	36.24	*48.09*	34.87	*47.67*	52.14	*49.97*
Household Size	6.06	*2.95*	6.13	*3.03*	5.31	*2.55*	5.74	*2.5*	5.67	*2.55*
Total Food Consumption (kg)	260.26	*331.68*	233.74	*376.36*	284.64	*1188.15*	224.88	*239.32*	223.75	*470.13*
Food Price Index	100.74	*11.83*	120.29	*12.00*	113.51	*13.14*	115.68	*8.48*	354.49	*18.81*
Livestock (TLU)	2.61	*3.38*	2.52	*3.38*	2.91	*2.78*	3.04	*3.24*	5.11	*5.6*
Cultivated Area (ha)	1.56	*1.46*	1.83	*7.73*	1.29	*1.1*	1.7	*1.8*	1.56	*1.37*
Total Production (kg)	723.34	*1200.92*	533.19	*940.59*	1177.8	*1432.12*	1375.02	*1311.46*	1499.22	*1772.06*
Cereal Cultivators (%)	85.67	*35.04*	71.19	*45.3*	90.69	*29.05*	97.03	*16.96*	89.54	*30.6*
Cereal Production (kg)	488.29	*813.45*	383.23	*719.6*	648.33	*782.77*	781.12	*829.42*	980.83	*1274.402*
Wheat Cultivators (%)	24.11	*42.79*	24.85	*43.23*	28.8	*45.3*	31.9	*46.62*	31.76	*46.57*
Wheat Production (kg)	87.48	*259.15*	77.48	*247.03*	124.36	*297.49*	129.89	*297.62*	152.41	*378.33*
Wheat Production (kg)	362.78	*423.08*	311.73	*415.75*	431.73	*418.07*	388.71	*405.79*	479.74	*542.12*
Wheat Sellers (%)	7.57	*26.46*	24.85	*43.23*	13.00	*33.64*	17.44	*37.96*	10.04	*30.06*
Wheat Net Sellers (%)	7.49	*26.33*	23.62	*42.49*	12.83	*33.46*	16.54	*37.17*	9.62	*29.51*
Wheat Buyers (%)	16.21	*36.87*	15.50	*36.49*	20.16	*40.13*	21.06	*40.79*	15.96	*36.64*
Wheat Net Buyers (%)	15.88	*36.56*	14.65	*35.37*	18.6	*38.92*	20.08	*40.07*	15.39	*36.1*
Wheat Autarkic (%)	14.49	*35.21*	0	*0*	10.94	*31.23*	11.85	*32.33*	19.83	*39.89*
Wheat Non Involved (%)	62.13	*48.52*	61.72	*48.62*	57.61	*49.43*	51.52	*49.99*	55.14	*49.75*
Wheat Sales (kg)	202.91	*154.59*	216.46	*273.50*	230.08	*218.75*	294.63	*363.53*	285.99	*328.81*
Wheat Purchases (kg)	43.57	*84.43*	59.94	*272.51*	70.70	*151.21*	50.91	*80.75*	71.20	*389.84*
Food-for-Work Dummy (%)	10.12	*30.17*	10.99	*31.29*	10.86	*31.13*	22.66	*41.88*	5.18	*22.18*
Wheat food-for-work (kg)	87.51	*79.19*	37.72	*56.19*	188.94	*199.29*	18.33	*46.4*	72.71	*93.84*
Food Aid Dummy (%)	15.22	*35.94*	7.57	*24.46*	27.65	*44.74*	26.09	*43.93*	28.23	*45.03*
Food Aid (kg)	69.84	*84.95*	33.14	*28.44*	102.51	*103.81*	85.11	*92.17*	71.91	*83.54*
Wheat Aid Dummy (%)	9.46	*29.28*	6.5	*24.66*	0.74	*8.57*	19.42	*39.57*	16.54	*37.71*
Wheat Aid (kg)	80.07	*54.15*	29.31	*19.08*	114.88	*81.32*	85.91	*80.02*	58.14	*55.44*
Number of Respondent Households						1215				

Note: ERHS data for households who respond at each round. Average quantities of food aid, wheat aid and wheat received through food-for-work programs are computed only on beneficiaries. Total production excludes chat, coffee and enset. Standard deviations are in parenthesis. Cultivators include households who sowed wheat but did not harvest because of shocks.