Aspirations and food security in rural Ethiopia

Daniel Ayalew Mekonnen and Nicolas Gerber

Invited poster presented at the 5th International Conference of the African Association of Agricultural Economists, September 23-26, 2016, Addis Ababa, Ethiopia

Aspirations and food security in rural Ethiopia

Daniel Ayalew Mekonnen and Nicolas Gerber
Center for Development Research (ZEF), University of Bonn

March 2016

Abstract

Despite some improvements in recent years, poverty and food insecurity remain widespread and the main challenges in Ethiopia. Using individual and household level data collected in rural Ethiopia, we examine if aspirations are strongly associated with well-being outcomes, as posited in the aspirations failure framework articulated by Ray (2006) and others. We employ both bivariate and multivariate analyses. We find that aspirations (particularly that of the household head) are indeed strongly associated with various triangulating measures of household food (in)security including per-capita calorie consumption, the food consumption score (FCS), the household dietary diversity score (HDDS), and the household food insecurity access scale (HFIAS). We discuss the channels through which aspirations might affect food security. Findings in this study provide suggestive evidence that policies aimed at improving food security might benefit from multiple effects (both direct and indirect) if they incorporate aspirations raising strategies.

Key words: Aspirations, farm households, food security, Ethiopia

1. Introduction

Despite some improvements in recent years, poverty and food insecurity remain widespread and the main challenges in Ethiopia. These challenges are further exacerbated by climatic shocks such as failure of rainfall, which adversely affect agriculture and allied activities, the main livelihood activities for the rural population[1]. In fact, following the failure of rainfall during the 2015 agricultural seasons, estimates suggest that about 10.1 million people require emergency food assistance as of December 2015 (EHRD, 2016). Poverty persistence had long been recognised as a major contributing factor for the continuing vulnerability of the food insecure group and this has led the government, jointly with development partners, to implement a social safety net program (PSNP) since 2005. This program aims at "smoothing consumption, reducing risks the poor face and protecting their assets" (GFDRE, 2009). In 2012, the PSNP reached over 7.6 million people and the program is complemented by a household asset building program (HABP), which provides food insecure households with financial services and technical support to strengthen their production systems by diversifying income sources, and increasing productive assets so as to improve their productivity (World Bank 2013).

Notwithstanding the potential benefits associated with policies such as the PSNP, the alleged benefits can be realized only under a set of conditions. For example, the recent weather related shocks highlight the level of vulnerability of the poor despite such programs. In addition, while earlier evaluations of the PSNP (e.g. Gilligan et al., 2009; Berhane et al., 2011, 2014; Coll-Black et al., 2011) find some positive impact of the program on food security, asset holdings and income growth, there is little evidence of graduation[2]. These studies attribute the lack of graduation, among others, to limited efficiency in program implementation, higher food prices and the nature of the program, i.e. targeting households which are both poor and food insecure. Yet, what is missing in these studies (and in the broader empirical literature on the determinants of food security) is the importance of psychological factors or 'internal' constraints, such as low aspirations. However, internal constraints are also important for they could reinforce external constraints (or material deprivations) and this may lead to a self-sustaining poverty trap and low levels of proactivity (Appadurai, 2004, Ray, 2006; Dalton et al., 2014). Aspirations are motivators of effort, for example, in terms of creating opportunities or exploiting available ones (Bandura, 2009; Bernard et al., 2008), which may lead to achieving food security. In this context, we study the effect of aspirations on food security in rural Ethiopia.

The next section presents the background and the review of related literature followed by section 3 which presents the data and descriptive statistics. The empirical strategy and results are discussed in section 4 and section 5 concludes.

[1] According to the Central Statistics Agency of Ethiopia (CSA), the rural population is estimated to constitute about 83 percent of the total which is estimated at 87,952, 000 as of July 2014. http://www.csa.gov.et/ (accessed Nov 17, 2015).

[2] "Graduation" is a situation where a household can meet its food needs for all 12 months and is able to withstand modest shocks in the absence of the PSNP (GFDRE 2007).

2. Background and literature review

2.1. Some concepts and measurements of food insecurity

Food security is a complex concept and its definition continues to evolve. The latest definition that refined the one adopted in the 1996 World Food Summit states that "food security (is) a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO, 2002). According to Jones et al (2013), this definition addresses concerns related to: inequitable distribution of food not only within countries but also within households, the ability to acquire socially and culturally acceptable food and the ways in which to acquire it, and the food composition and micro nutrient requirements. Food insecurity on the other hand is a state "when people do not have adequate physical, social or economic access to food" as defined above (FAO, 2002).

To operationalize the definition of food (in)security, empirical studies often use one or some combination of the four domains that reflect: food availability, access, utilization, and the stability of food over time. Yet, the complexity of the concept is simply evident from the availability of multiple approaches and tools for assessing food security. For example, in some cases, the concept of food insecurity is used interchangeably with nutrition insecurity even though nutrition security requires food security along with "care, health and hygiene practices" (Jones et al, 2013). A related concept often used to measure food and nutrition insecurity is undernutrition, which is "caused by undernourishment –defined as a level of food intake insufficient to meet dietary energy requirements" (FAO, 2015). In the same report, hunger is defined as synonymous with chronic undernourishment. This simply shows that the concepts are overlapping (Jones et al, 2013, see Figure 1), and hence a diverse pool of food and nutrition security measurements exist. Based on a systematic review of available measurements, Jones et al (2013) and Pangaribowo et al. (2013) argue that the choice of which measurement to use requires understanding the underlying constructs and identifying the intended use of a tool (or the intended use of the data to be collected).

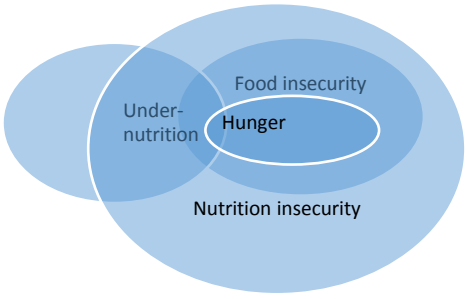


Figure 1. Overlapping concepts within the context of food and nutrition security. The figure is from Jones et al (2013) who adapted it from Benson (2004).

2.2. Empirical evidence on the state of food (in)security and their determinants

The latest report on the *State of Food Insecurity in the World* (FAO, IFAD and WFP, 2015) estimates the number of people undernourished in 2014-16 at 795 million or 10.9 percent of the total, a reduction from 18.6 percent in 1990-92. The report notes that the vast majority of the hungry (780 million people) live in the developing world and the overall share of the hungry currently stands at 12.9 percent of the total population. The same report estimates that the share of people in Ethiopia who are undernourished in 2014-16 is 32 percent, a reduction from 74.8 percent in 1990-92. According to the report, this improvement in Ethiopia could be attributed to several interlinked factors including the high GDP growth rate the country has been experiencing in the recent years and the existing social protection program (PSNP). This assertion of attribution echoes other studies such as World Bank (2015), Berhane et al (2011, 2014) and Dorosh and Rashid (2012). According to World Bank (2015), for example, real GDP growth in the country averaged 10.9 percent between 2004 and 2014 and a significant part of this growth comes from agriculture. If this is indeed the case, the reduction in undernutrition may not be surprising for the majority of the people depend on agriculture, a sector which had been found to have a high growth poverty elasticity (e.g. Christiaensen and Demery, 2007), and poverty is arguably one of the determinants of food and nutrition security. In this context, Tafesse (2005) estimates that a one percentage increase in agricultural per capita value added in Ethiopia would result into a one percent decline in poverty level of rural households.

As the concept of food and nutrition security (FNS) evolves, rigorous and national level studies on the determinants of FNS in Ethiopia are largely lacking. A brief review of available studies, which are mainly limited to smaller geographic areas and often associated with project evaluations, sheds some light regarding one or the other domains of food security. In this context, Asenso-Okyere et al.(2013), for example, study the determinants of food security in selected agro-pastoral communities in south-eastern Ethiopia. Using availability of food in the household as proxy indicator to food security, they find that the most significant factors affecting household food security are: the educational level of the spouse and that of the household head, size of farm land, availability of household assets including livestock, peace and security. Beside household endowments such as land (Feleke et al, 2005), Negatu (2004) report that livelihood diversification strategies such as livestock rearing, growing cash crops, and engagement in trading are important factors for achieving household food security (measured by calories consumption per adult-equivalent).

Food insecurity is also affected by seasonality or by irregular shocks such as weather events, deaths or conflicts (Barret, 2010). Based on a household survey data from 15 villages in rural Ethiopia, Dercon and Krishnan (2000), for example, find that the nutrition status, a widely used indicator of FNS, of adults in poor households as opposed to richer households is affected by idiosyncratic agricultural shocks. Food insecurity may be chronic or transitory depending on the frequency of such shocks (Jones et al, 2013). In response to temporary shocks, households may resort to the sale of assets and other coping strategies which may in turn lead to more sever shocks, failed returns on investments, and an eventual fall into a state of chronic food insecurity (Jones et al., 2013). In the event of such shocks, food aid through

different modalities is the often used policy response. In this context, a few studies (e.g. Yamano et al., 2005; Quisumbing, 2003; and Gilligan and Hoddinott, 2007) examine the importance of food aid programs following drought or harvest failures on food security in Ethiopia. These studies find positive impact of such transfers on consumption or child nutrition outcomes, but Gilligan and Hoddinott (2007) also uncover some evidence of food aid dependency. In addition, even the achieved positive effects are considered to be short term as the country continues to suffer from food insecurity even in good harvest years (Clay et al, 1999), the realization of which had led to the policy shift from such "ad hoc responses" to the more planned and systematic approach of the PSNP (GFDRE, 2009).

In general, the presence of widespread food insecurity in Ethiopia is argued to be the result of several factors including recurrent drought and heavy reliance on nature, use of backward agricultural technologies (or low input –low output production systems), and inappropriate agricultural policies in the past (Devereux and Sussex, 2000). Relatedly, von Braun and Olofinbiyi (2007) more broadly classify the major factors of food crisis in the country as: population pressure, production failures, marketing failures, and policy, institutional, and organizational failures.

However, what might be an important determinant and yet largely ignored in the studies reviewed here or more generally the broader empirical literature on food security is the role of internal constraints, specifically aspirations. This study contributes to filling the gap using data collected from sample households in rural Ethiopia

3. Data and descriptive statistics

3.1. Data

We conduct a household survey between January and March 2014 in Ethiopia. We re-interviewed an existing sample of agricultural households surveyed in 2006 and again in 2010 in Oromia region under an NGO project, which ended in 2010, aimed at promoting agricultural innovations. The original survey used a mix of purposive and random sampling procedures to select 390 households from three study sites (i.e. 130 households per site) (Aredo, et al. 2008). The primary sampling unit (i.e. study site) consisted of a pair of neighboring districts or *woredas*, namely Bakko and Sibu-Sire, Lume and Adaa, and Hettosa and Tiyyo. The districts were chosen based on the density of cultivation of the major crop (maize, teff or wheat) and on the presence of active farmers' cooperatives. In the second stage, *kebeles* (sub-districts) with active farmers' cooperatives were purposively selected. Finally, using the number of participating households within a cooperative as the sampling frame, households were randomly selected.

Our survey covered 379 households. Between one and three households in each district dropped out of our survey for various reasons, including death, relocation to another area or unavailability for the survey interview. Nevertheless, when compared against the full sample, the households that dropped out of the survey did not show any statistically significant baseline difference with regards to key indicators such as income, wealth, and landholdings

(results not reported but available upon request). Yet, we have also a missing data problem with regards to some households. We exclude these from the main analysis because of the need for complete data, which reduces the final sample size to 375 households.

In addition to the basic socio-economic indicators, the survey collected information on individual aspirations and future expectations on four indicators including: income, wealth, social status and children's education. The survey also collected information about the corresponding weight each attaches to each of the four indicators. Following Bernard and Taffesse (2014), the aspirations level is calculated using an aggregate index based on respondents' answers to questions about their aspirations in the four dimensions. The aggregate aspirations index is then used to classify individuals into low-aspirations and high-aspirations status by comparison to the district average.

The calculation of the aggregate aspirations index (A_i) can be represented as:

$$A_i = \sum_{n=1}^{4} \left(\frac{a_n^i - \mu_n^d}{\sigma_n^d}\right).w_n^i \qquad (1)$$

Where:

a_n^i is the aspired outcome of individual i on dimension n (income, assets, education, or social status).

μ_n^d is the average aspired outcome in district d for outcome n.

σ_n^d is the standard deviation of aspired outcomes in district d for outcome n.

w_n^i is the weight individual i places on dimension n.

3.2. Descriptive statistics

3.2.1. Income and wealth

We begin with the descriptive statistics on income and wealth indicators to show how the sample households have fared over time (2006-2014). Table 1 presents the mean and median annual income of study households by income source. The data suggest that annual income has improved between 2006 and 2014 for each income source except for livestock income, and for income from all sources combined. The per-capita income has grown by about 23 percent during the same period. Similarly, Table 2 shows that, on average, the total value of assets owned by households has increased during the specified period. The value of livestock holdings take the lion's share in the value of total asset holdings, and its significant decline in 2010 fully explains the total decline in the total value of assets for that year.

Table 1. Annual household income by source (Ethiopian Birr, at 2006 constant terms)[3].

	2006			2010			2014	
Source	N	Mean	Median	N	Mean	Median	N	Mean	Median
Livestock income	295	3172	1609	328	2924	1326	329	2303	1288
Crop income	387	12128	9886	383	13873	11425	376	14788	10489
Agricultural income	**390**	**14434**	**11562**	**384**	**16334**	**13787**	**377**	**16758**	**12134**
Business and wage labor	164	3190	942	227	2562	1236	185	4797	1795
Transfers income	5	1840	300	28	1169	562	81	2047	1077
Off-farm income	**168**	**3169**	**942**	**236**	**2603**	**1273**	**230**	**4579**	**1843**
Total income	**390**	**15799**	**12296**	**384**	**17935**	**14974**	**379**	**19449**	**13848**
Total income per-capita	***390***	***2290***	***1794***	***384***	***2596***	***2182***	***379***	***2899***	***2122***

Table 2. Total value of assets owned by the HH (in ETH Birr) at 2006 constant terms

	2006 (n=386)		2010 (n=384)		2014 (n=379)	
	Mean	Median	Mean	Median	Mean	Median
Value of production assets	403	100	963	129	1,743	455
Value of consumer durables	934	234	959	392	2,359	788
Value of livestock	10,273	7,865	5,752	4,413	14,969	10,630
Total value of assets	***11,611***	***9,127***	***7,674***	***5,977***	***19,071***	***14,089***

Since the data on aspirations is available only for the 2014 survey, we could not show if there was any correlated trend between aspirations and income or wealth indicators over time. Yet, we conduct mean comparisons across indicators including annual household income per adult equivalent, monthly per capita expenditure, and the value of assets hold by people with different levels of aspirations. According to Table 3, individuals with high aspirations have on average higher income or wealth by comparison to those with low aspirations and the difference is statistically significant at less than 1 percent (with the only exception of per-capita expenditure for spouses with low and high aspirations). These descriptive statistics[4] in general reflect a preliminary evidence that aspiration could be one of the strong correlates of poverty (or income) and by extension food security as poverty is one of the strong determinants of food security, particularly in poor countries where effective social protection programs rarely exist.

Table 3. Mean comparison of the 2014 household income and wealth (in ETB) by aspirations level of the spouse and head of the household

	Household head			Spouse		
	Mean outcome (High Asp.)	Mean outcome (Low Asp.)	*Mean difference: p-value*	Mean outcome (High Asp.)	Mean outcome (Low Asp.)	*Mean difference: p-value*
Total annual income per-adult equivalent	12453	8170	*0.0001*	14167	9825	*0.0003*
Monthly per-capita consumption expenditure	593	506	*0.0051*	572	542	*0.3734*
Total value of assets	77662	39991	*0.0000*	89702	59822	*0.0008*

[3] The official exchange rate during the time of the survey was 1 USD=19 ETB according to the National Bank of Ethiopia (see http://www.nbe.gov.et/market/searchdollarcurrencies.html , accessed last February 9th, 2016).
[4] Descriptive statistics of other variables used in the study are presented in Table A.1. in the appendix.

3.2.2. Food Security

Food security, as discussed in the literature review, is a broad and complex concept and we try to capture its multidimensionality (i.e. availability, access, utilization and stability) by employing widely used indicators. We construct triangulating measures of food (in)security including per-capita calorie consumption, food consumption score (FCS), household dietary diversity score (HDDS), household food insecurity access scale (HFIAS), and the incidence of inadequate food supply in the household in the previous 12 months. We capture intra-household food allocations based on the information we collect by asking whether all household members eat the same diet, and whether each of them eats a more- or less-diversified diet and how many times a day, by age categories.

The measurement of food consumption using kilocalories (such as per-capita calorie consumption) is referred to as the "gold standard" to measure food security but its implementation is challenging for it requires the collection of detailed food intake data which is time consuming (WFP, 2008). This study however benefits from the availability of such information in the data, which also helps triangulate the result from other indicators. One of the alternative tools to measuring food security is the WFP's (2008) FCS that measures the frequency of consumption of different food groups consumed by a household during the 7 days before the survey. In this approach, different food items are first categorized into 9 main groups and a food consumption score is then calculated using weights assigned to each food group[5]. Using FCS cut-offs which had been validated based on data collected from households in different countries (e.g. Wiesmann et al, 2009), this technique categorises households into three food security groups: *poor, borderline and acceptable.*

A related composite measure is the HDDS, which reflects the average household dietary diversity and proxies for household's food access (Swindle and Bilinsky, 2006). HDDS differs from FCS for it does not attach any weight among different food items and also does not take into account the frequency of consumption of a certain food. Further, it often uses a 24-hour recall period which is shorter than the seven-days recall used in FCS. The average HDDS is calculated based on whether anyone in the household consumed any of the 12 types of food groups[6]. To examine household food access, the resulting HDDS is compared among income groups such as income-terciles.

On the other hand, household food insecurity could also be measured using the HFIAS, which captures the household's food insecurity (in terms of access), including the frequency of occurrence of the event in the 4 weeks prior to the survey (Coats et al, 2007). In this measure, three dimensions of occurrence of food insecurity are captured: "anxiety and

[5] The 9 main food groups and the given corresponding weights (in parenthesis) include- Main staples: cereals, starchy tubers and roots (2); Pulses: legumes and nuts (3); Meat and fish: beef, goat, poultry, pork, eggs and fish (4); Vegetables (including green leaves) (1); Fruits (1); Oil: oils, fats and butter (0.5); Milk: milk, yogurt and other diary (4); and Sugar: sugar and sugar products, honey (0.5). For details including calculation steps, see WFP's (2008).

[6] These food groups include: cereals; root and tubers; vegetables; fruits; meat, poultry offal; eggs; fish and sea food; pulses/legumes/nuts; milk and milk products; Oil/fats; Sugar/honey; miscellaneous. HDDS is then calculated following Swindale and Bilinsky (2006).

uncertainty about the household food supply; insufficient quality (includes variety and preferences of the type of food); and, insufficient food intake and its physical consequences" (Coats et al, 2007: p.6). The HFIAS is then calculated by summing over the frequency-of-occurrence of food insecurity-related conditions with higher value indicating severe food insecurity. Following the recommended cut-offs (Coats et al, 2007), households are then categorised into 4 levels of household food insecurity: *food secure, mild, moderately* and *severely food insecure*. Next, we provide empirical evidence on the level of household food (in)security among the study households using the indicators discussed above.

To begin with, based on the direct responses by the household head (and/or the spouse), the data suggest that only about 7 percent of households had a situation where the household did not have enough food in the previous 12 months. In terms of intra-household food allocations, under-five children had, on average, 4 meals per-day by comparison to 3 meals eaten by other household members. Further, about 83 percent of households reported that all household members eat roughly the same diet while the remaining report that children eat more diverse foods.

On the other hand, based on the recommended cut-offs to food (in)security measurements such as FCS and HFIAS, the data suggest that the share of households in the sample who are food insecure are between 7 and 10 percent (see Table 4 and Table 5). However, when we investigate the calorie consumption using the 2,100 kilocalories[7] per person and day dietary energy requirement, the share of households that can be considered food insecure increases to 27 percent (Table 6). Further disaggregation of the data by calorie consumption thresholds reveal that households who are considered greatly food insecure (<1470 kcal) and those on the borderline (≥ 1,470 and < 2,100 kcal) are about 6 percent and 21 percent, respectively (Table 6). These figures may seem a great underestimation of the level of food insecurity by the country standard since FAO's (2014) estimate puts the share of people undernourished in 2012-14 at 35 percent. However, we offer two reasons: (1) our sample households were drawn from relatively well-off districts in terms of average land holdings and agricultural potential, and (2) data were collected immediately after harvest. These two factors may tend to overstate the likelihood of availability of food in the sample households. Nonetheless, availability of food does not necessarily guarantee access to- and utilisation of- food and by extension overall food security. To that end, we cross-tabulate one measure of diet quality (HDDS) against per-capita food expenditure terciles. According to Figure 2, the average diet diversity increases with the increase in expenditure. Further, consumption of food groups such as fruits, meats, and eggs greatly vary by income group with progressive increase. For example, the share of households that consume fruits, meats, and eggs for the lowest expenditure group is 13%, 21%, and 33%, respectively while corresponding figures for each food group by the middle expenditure group are roughly twice, and that by the top expenditure group are roughly thrice. Pairwise correlation of per-capita calorie consumption,

[7] The cut-off point, as the minimum caloric requirement, used by official reports in Ethiopia is 2200 kilocalories (See MOFED, 2013). If we were to use that cut off point, the number of food insecure groups would rise to 32 percent. However, we use 2100 kcal cut-off to keep consistency with the internationally used measures and in line with other indicators employed in this study.

FCS, HDDS, HFIAS and per-capita food expenditure suggests that all except HFIAS score are statistically significantly correlated to each other (Table 7).

Table 4. Households by food consumption score (FCS)[8] profile

	Freq.	Percent	% with low-aspirations within each food (in)security profile	
FCS profile			Head	Spouse*
Poor (FCS<=28)	3	0.79	33	100
Borderline (28.5<= FCS<=42)	24	6.35	58	71
Acceptable (FCS<=42)	351	92.86	31	64

*Note: Corresponding statistics does not include female headed households which account about 10 percent of the total.

Table 5. Households by household food insecurity access scale (HFIAS) profile[9]

	Freq.	Percent	% with low-aspirations within each food (in)security profile	
HFIAS category			Head	Spouse*
Food secure	340	90.19	30	64
Mildly food insecure	9	2.39	78	40
Moderately food insecure	21	5.57	43	83
Severely food insecure	7	1.86	71	67

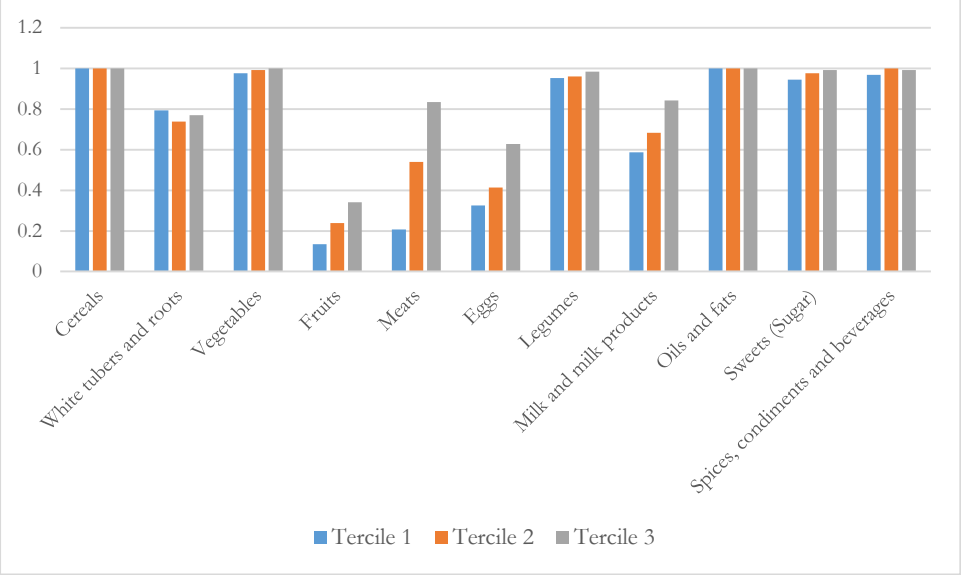
*Note: Corresponding statistics does not include female headed households.

Table 6. Households by per-capita calorie consumption profile[10]

	Freq.	Percent	% with low-aspirations within each food (in)security profile	
Calorie consumption thresholds			Head	Spouse*
Poor (<1470 kcal)	21	5.56	38	67
Borderline (≥ 1,470 – < 2,100 kcal)	82	21.69	38	61
Acceptable (>=2100 kcal)	275	72.75	31	67

*Note: Corresponding statistics does not include female headed households.

Fig. 2. Dietary diversity score (HDDS) by per-capita consumption expenditure terciles



[8] FCS thresholds constructed following Wiesmann et al (2009).
[9] Household Food Insecurity Access category was determined following Coates et al (2007).
[10] The calorie value of foods consumed in the household calculated using FAO's calorie conversion factors. calorie/gmhttp://www.fao.org/docrep/003/X6877E/X6877E20.htm. Calorie consumption thresholds are based on Wiesmann et al (2009).

Table 7. Pairwise correlation of various food (in)security indicators

	Per-capita calorie consumption per day	FCS	HDDS	HFIAS score	Per-capita monthly food expenditure
Per-capita calorie consumption per day	1				
FCS	0.2658*	1			
HDDS	0.2305*	0.7294*	1		
HFIAS score	-0.104	-0.1356	-0.1295	1	
Per-capita monthly food expenditure	0.7618*	0.4392*	0.3903*	-0.1634	1

One of the preliminary approaches to see the possible links between household food security and aspirations is to examine the share of people with low-aspirations that belongs in each food (in)security profile across indicators. Accordingly, Tables 4 to 6 present such descriptive statistics for household heads and spouses separately. For example, Table 4 shows that among households whose food security profile is considered "poor", the share of household heads with low aspirations is 33 percent while corresponding figure for spouses is 100 percent. Similarly, as Table 5 shows, among households who are considered "severely food insecure", the share of household heads with low aspirations is 71 percent while the corresponding figure for spouses is 67 percent. Further, spouses with low aspirations account for more than 50 percent of all spouses in households which are considered "food insecure" and this is the case for almost all indicators (Tables 4 to 6). While the large proportion of household heads that belong in households which are "food insecure" seem to have low aspirations, there is no clear trend across various indicators. In general, these preliminary evidences imply that it may be useful to control for the aspirations status of both the household head and the spouse while studying food security correlates using multivariate analysis.

4. Estimation and results

The food security status (y) of the jth household[11] can be expressed in the following function:

$$y_j = f(A, I, H, C) \qquad (1)$$

Where, *A* represents the aspirations status (of the household head and of the spouse), *I* denotes other characteristics of the household head and of the spouse, *H* and *C* respectively denote other household and community level characteristics. As opposed to the assumption behind unitary household models where preferences (or decision making) of the household is often proxied by that of the preferences of the head of the household, in this study we assume joint decision making by the two spouses and hence income, wealth or food security of the household is determined by the characteristics of both the head of the household and of the spouse, in combination with other household and community characteristics. We estimate a series of an ordinary least squares (OLS) model relating indicators of household food (in)security with aspirations of the household head and of the spouse and a wide range of other potential determinants. Yet, our purpose remains to see if aspirations of the two spouses, given other factors, are strong correlates of household food security without necessarily claiming causal relations. This is because regression results might still be

[11] When the unit of analysis the individual level (e.g. if "y" is subjective well-being), *A* and *I* respectively denote the aspirations status and other characteristics of the individual. All other variables remain the same.

confounded by unobserved household-specific heterogeneity which we could not account for since we only have cross-sectional observations on the main variables of interest (i.e. aspirations and food (in)security). Yet, some (e.g. Angrist and Pischke, 2009) argue that strong correlations sometimes suggest causal relations and hence policy implications could still be drawn from such analysis.

4.1. Results and discussion

We have shown in a bivariate context that aspirations and food security are positively correlated. In this section, we examine if that relationship still holds and whether the correlation is statistically significant after controlling for other potential determinants of the four pillars of household food security, namely, availability, access, utilization, and stability of food at all times. Following the existing literature and their availability in the data, we use per-capita calorie consumption, FCS, HDDS and HFIAS as measures of food (in)security.

Table 8 presents a summary of the main correlates of food (in)security. Since it is likely that the aspirations of the household head and the spouse are correlated, we control for that effect using an interaction term of the aspirations index of the two spouses (see result columns 1 - 4). Results suggest that aspirations are indeed strongly associated with household food (in)security. For example, according to column 1, a standard deviation increase in the aspirations level of the household head is associated with a (422.4 × 0.61) = 257.7 calories per-capita per-day increase in household consumption. This is roughly a (257.7/2997) = 8.6 percent increase over the mean calories consumption per-capita per day. Similarly, according to columns 2 to 4 respectively, a standard deviation increase in the aspirations index of the household head is associated with a (4.5 × 0.61) = 2.75 points increase in FCS, a (0.36 × 0.61) = 0.22 points increase in HDDS, and a (0.34 × 0.61) = 0.21 points decrease in HFIAS (recall that unlike other indicators, HFIAS actually measures food insecurity)[12]. In reference to the corresponding mean outcomes, these are roughly a (2.75/71.4) = 3.9 percent increase in FCS, a (0.22/8.68) = 2.5 percent increase in HDDS, and a (0.21/0.48) = 44 percent decrease in HFIAS.

Further, in order to check if other results would hold in a unitary household model framework, we exclude the aspirations index and other characteristics of the spouse of the household head from subsequent estimations (see columns 5-8) and control for the gender of the household head. While the magnitude of the coefficient estimates for the aspirations index of the household head slightly decline, the correlation remains statistically significant in three out of the four indicators of the household food (in)security. This perhaps underlines the importance of controlling for the aspirations and other characteristics of the spouse of the household head even though the coefficient estimates of the spouse's aspirations index are not themselves statistically significant (columns 1-4). Doing so is further supported by not

[12] Female headed households drop out from the analysis (column 1-4) when we consider the characteristics of both the household head and the spouse. Thus, the corresponding mean values (for columns 1-4) of per-capita calorie consumption, FCS, HDDS, and HFIAS are respectively 2997, 71.4, 8.68, and 0.48. The corresponding mean values for the full sample regardless of household headship are 3040, 70.5, 8.6, and 0.49.

only other studies (e.g. see Strauss and Thomas (1995) for a survey of the literature) but also by the statistical evidence of the spouse's education as a statistically significant correlate of FCS and HDDS (column 2 and 3).

Table 8. Correlation of aspirations and other factors with food (in)security

	(1) pc_Calorie	(2) FCS	(3) HDDS	(4) HFIAS	(5) pc_Calorie_H	(6) FCS_H	(7) HDDS_H	(8) HFIAS_H
Aspirations Head	422.38***	4.50**	0.36**	-0.34**	364.38***	2.82	0.28**	-0.35**
	(129.72)	(1.81)	(0.15)	(0.16)	(123.54)	(1.98)	(0.13)	(0.16)
Aspirations Spouse	-183.02	-0.88	-0.07	-0.00				
	(122.89)	(1.76)	(0.13)	(0.29)				
Aspirations(Head*Spouse)	-82.35	-4.96***	-0.12	0.18				
	(92.69)	(1.52)	(0.13)	(0.19)				
Aspirat.*INChange(2006-10)	0.00	0.00	0.00	-0.00	-0.00	0.00	0.00	-0.00
	(0.06)	(0.00)	(0.00)	(0.00)	(0.05)	(0.00)	(0.00)	(0.00)
Female hh head $^{+}$					6.39	-6.08*	-0.57**	0.09
					(254.72)	(3.35)	(0.24)	(0.33)
HH head Age31-50^{+}	-170.90	-2.87	-0.49	-0.59	65.69	-1.15	-0.28	-0.19
	(306.19)	(5.72)	(0.38)	(0.76)	(245.55)	(4.18)	(0.30)	(0.58)
HH head Age above51^{+}	-267.57	-4.38	-0.62	-0.76	-48.14	-2.25	-0.48	-0.46
	(337.34)	(6.05)	(0.40)	(0.69)	(258.40)	(4.24)	(0.32)	(0.52)
Spouse Age31-50^{+}	103.65	1.93	0.10	0.14				
	(205.33)	(2.97)	(0.24)	(0.26)				
Spouse Age above51^{+}	-92.47	3.67	0.46	-0.33				
	(272.30)	(3.76)	(0.32)	(0.34)				
Head education: 0-4^{+}	-106.28	-5.99**	-0.51**	-0.16	107.32	-4.92*	-0.46**	0.10
	(209.68)	(2.97)	(0.22)	(0.48)	(191.58)	(2.67)	(0.20)	(0.34)
Head education: 5-8^{+}	-113.99	0.16	-0.09	-0.70*	70.13	0.45	-0.13	-0.35
	(199.53)	(2.64)	(0.21)	(0.42)	(184.86)	(2.42)	(0.19)	(0.28)
Head education: 8+$^{+}$	13.05	0.82	-0.24	-0.60	3.21	0.58	-0.24	-0.15
	(237.26)	(3.28)	(0.24)	(0.41)	(256.19)	(2.83)	(0.21)	(0.38)
Spouse education: 0-4^{+}	199.23	2.64	0.10	0.46				
	(167.94)	(2.59)	(0.20)	(0.46)				
Spouse education: 5-8^{+}	-274.66	1.36	0.21	0.42				
	(201.28)	(2.99)	(0.22)	(0.38)				
Spouse education: 8+$^{+}$	154.56	8.61**	0.62**	0.37				
	(308.88)	(4.15)	(0.31)	(0.34)				
HH size(ln)	-991.32***	5.78*	0.78***	0.68	-1,372.61***	6.49**	0.74***	0.40
	(256.25)	(3.25)	(0.28)	(0.49)	(258.99)	(2.67)	(0.23)	(0.34)
Dependency ratio	102.32	5.25	0.38	0.27	-210.73	2.65	0.10	0.09
	(400.88)	(5.44)	(0.47)	(0.39)	(360.02)	(4.37)	(0.35)	(0.37)
HH head in business/wage^{+}	-334.85**	-2.95	0.02	-0.12				
	(152.56)	(2.32)	(0.16)	(0.28)				
Spouse in business/wage^{+}	159.60	2.41	0.31*	0.32				
	(171.65)	(2.24)	(0.17)	(0.38)				
Off-farm income^{+}					-130.53	0.06	0.05	0.19
					(141.00)	(1.85)	(0.14)	(0.20)
Change in Income (2006-10)	0.00	0.00	-0.00	-0.00*	0.01	0.00	-0.00	-0.00
	(0.06)	(0.00)	(0.00)	(0.00)	(0.05)	(0.00)	(0.00)	(0.00)
Income per-adult equiv.	0.05	0.00***	0.00***	-0.00	0.03	0.00***	0.00***	-0.00
	(0.04)	(0.00)	(0.00)	(0.00)	(0.04)	(0.00)	(0.00)	(0.00)
Value of assets (ln)	-77.23	0.07	0.15*	-0.20	-30.53	0.77	0.19***	-0.21*
	(71.11)	(1.00)	(0.08)	(0.13)	(66.91)	(0.87)	(0.07)	(0.13)
Livestock holding(TLU)	58.02***	0.50**	0.01	0.00	47.09***	0.30	-0.00	0.01
	(17.00)	(0.23)	(0.02)	(0.02)	(16.51)	(0.22)	(0.02)	(0.02)
Land holdings in ha(ln)	33.36	-0.77	-0.15	-0.17	170.92	2.06	-0.03	-0.26
	(154.76)	(1.98)	(0.18)	(0.20)	(169.48)	(2.06)	(0.17)	(0.18)

Shocks experience								
Too much rain or flood[+]	594.27*	6.63**	0.38	0.08	493.57*	5.58*	0.49**	0.12
	(356.11)	(3.18)	(0.25)	(0.88)	(275.17)	(2.89)	(0.20)	(0.67)
Livestock diseases[+]	238.35	-1.80	-0.04	0.04	426.32	-1.84	-0.14	0.45
	(281.38)	(3.21)	(0.23)	(0.66)	(279.23)	(2.78)	(0.21)	(0.58)
Increased input prices[+]	-79.46	-2.35	-0.14	1.22**	96.41	-2.89	-0.06	0.70
	(224.08)	(3.36)	(0.21)	(0.59)	(211.23)	(3.09)	(0.20)	(0.52)
Death or loss of livestock[+]	-191.19	-0.04	0.25	-0.56	-120.11	0.46	0.28	-0.34
	(201.14)	(3.34)	(0.21)	(0.53)	(196.97)	(3.10)	(0.19)	(0.52)
Illness of head/spouse[+]	-190.48	-3.64	-0.47*	0.86	-156.54	-0.26	-0.33	0.42
	(230.75)	(2.86)	(0.26)	(0.73)	(203.55)	(2.90)	(0.24)	(0.61)
Illness of other family[+]	484.20**	4.60	0.47**	0.33	294.93	4.61	0.35*	0.39
	(237.91)	(3.21)	(0.22)	(0.64)	(214.57)	(2.90)	(0.20)	(0.58)
Average distance to services								
Road (minutes)(ln)	-80.96**	0.10	-0.01	0.06	-42.34	0.29	0.01	0.04
	(39.38)	(0.42)	(0.03)	(0.04)	(38.46)	(0.45)	(0.03)	(0.04)
Market(minutes)(ln)	-53.17	-2.85***	-0.28***	-0.05	-71.33	-2.66***	-0.25***	-0.04
	(81.56)	(1.06)	(0.08)	(0.12)	(82.39)	(0.97)	(0.07)	(0.10)
Micro-finance (minutes)(ln)	63.99	2.47*	0.12	-0.13	159.08	2.09	0.09	-0.28*
	(111.41)	(1.43)	(0.12)	(0.14)	(101.01)	(1.31)	(0.10)	(0.14)
Health center(minutes)(ln)	166.19	3.34***	0.15	-0.11	68.41	2.67**	0.09	-0.10
	(103.22)	(1.23)	(0.10)	(0.09)	(89.27)	(1.10)	(0.09)	(0.10)
Bako-Sire	-454.32***	-1.51	-0.48**	0.46	-241.10	-0.78	-0.36*	0.27
	(169.15)	(2.86)	(0.24)	(0.29)	(155.23)	(2.54)	(0.20)	(0.29)
Hitossa-Tiyo	752.40***	6.98**	0.17	-0.15	848.16***	7.92***	0.26	-0.20
	(194.77)	(2.76)	(0.22)	(0.21)	(189.00)	(2.45)	(0.19)	(0.18)
Constant	4,286.69***	37.71***	6.01***	2.42	4,343.51***	32.54***	5.97***	3.49**
	(928.07)	(14.15)	(1.05)	(1.76)	(948.31)	(11.76)	(0.88)	(1.62)
Observations	302	302	302	302	374	374	374	375
R-squared	0.35	0.31	0.31	0.23	0.32	0.29	0.30	0.16

Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01. [+]Binary outcomes.

The strong correlations between aspirations and food security indicators should be put into context, as explained next. Aspirations may affect food security through different channels. First, aspirations may improve households' forward looking behavior and motivate them to reduce risk by diversifying their livelihood strategies (e.g. by engaging in non-farm income generating activities) which may lead to improved food security (e.g. through improved purchasing power or economic access). Secondly, aspirations may motivate households to reduce their risk aversion and encourage them to invest in agricultural innovations, major determinants of agricultural productivity, which in turn may determine some aspects of food security (such as food availability and stability). Thirdly, farming in Ethiopia is a labor intensive sector and productivity may depend on the physical fitness of farm labor, which in turn is determined by the health status and consumption of foods that provide the necessary nutrients and adequate calories. In this context, aspirations may motivate households to consume more diversified and dietary foods and to make other investments that would improve their health and nutrition status, leading to at least one aspect of food security (e.g. utilisation). Despite the wide range of control variables including income growth in the past (i.e. between 2006 and 2010) and its interaction term with aspirations, this study does not establish causal inference. However, the findings provide suggestive evidence that higher aspirations may lead to improved food security.

Moving on to other results, we find that resource endowments such as annual household income, assets, livestock holdings and relative wealth status (i.e. belonging to higher wealth

quintiles) are positively correlated with some of the food security indicators (columns 1-8). Besides having an education level higher than 8th grade, engagement of the spouse of the household head in non-farm income generating activities tends to improve the household's dietary diversity (column 3). This is because education enhances the nutrition knowledge of the main care giver (often wives in rural Ethiopia) and their engagement in income generating activities increases the resources that might be available at their disposal. Further, negative shocks such as illness of the household head or the spouse and large increases in input prices are negatively associated with food security (column 3 and 4) which is in line with the theory and empirical studies that suggest that shocks of these nature may disrupt food security (e.g. Barrett, 2010; and Dercon and Krishnan, 2000). As expected, remoteness of the household from the market and asphalt road is also negatively associated with food security (columns 2, 3, 6 & 7). This is because, access to roads and markets determine accessibility and stability of food. Surprisingly, however, results suggest that remoteness of the household from micro-finance institution and health center, and the incidence of illness of a household member other than the head and spouse are positively correlated with some of the indicators of food security (columns 2, 6 & 8). Lastly, results also suggest that female headed households are more likely to be food insecure (columns 6 & 7).

5. Summary and conclusions

This study empirically examines if aspirations are important correlates of food security in rural Ethiopia. We establish robust evidence by employing several objective as well as subjective measures of food (in)security that also reflect the multi-dimensionality of the concept. Descriptive statistics suggest that individuals with high aspirations have on average higher income or wealth by comparison to those with low aspirations and the difference is statistically significant. Similarly, across different food security categories, the share of people with low-aspirations increases as we move from the most food secure to the extremely food insecure categories, and this is true for most of the indicators.

We use regressions to relate each food (in)security outcome against the aspirations indicator and other potential drivers including human capital and the household's access to: natural capital, physical capital, financial capital, services (e.g. roads, markets, health center); and the household's experience of various shocks. To account for the unobserved factors common to all residents in each study site, we control for district dummies. The main finding of the study, which is robust across outcome indicators, is that the aspirations of the household head are important predictors of household food security in rural Ethiopia. While we fail to find a statistically significant effect of the aspirations of the spouse, their inclusion along with other characteristics of the spouse in the regressions increase the magnitude of the coefficient estimates for the aspirations of the household head. This perhaps indirectly underscores the importance of the spouse's contribution to the household decision-making and corresponding outcomes.

Despite the cross-sectional nature of the data used in this study, which is the major limitation for unobserved household characteristics might still affect both the aspirations and food

security or the possibility of reverse causation, the robustness of findings across various indicators suggest that aspirations are indeed strong determinants. Yet, it is important to note that we have controlled for present income and wealth, the change in income in the past (i.e. between 2006 and 2010) and its interaction term with aspirations, and a wide range of other factors which might affect both the aspirations and the present level of outcome indicators. This perhaps might help minimise the influence of the error term that would result from the unobserved heterogeneities. Further, we had also established (in other unpublished papers) that aspirations are also strongly correlated with the adoption of agricultural innovations and risk-taking behavior which are all underlying determinants of household food security. Therefore, we conclude that policies aimed at improving food security should incorporate aspirations-raising strategies for they could benefit from these multiple effects of aspirations (i.e. direct and indirect effects). This may involve direct motivations and/or other strategies which may target the determinants of aspirations that would help break behavioral poverty traps. Finally, the policy relevance of findings in this study could be emphasised in the words of Bandura (2009) who states that "failure to address the psychosocial determinants of human behavior is often the weakest link in social policy initiatives. Simply providing ready access to resources does not mean that people will take advantage of them."

References

Appadurai, A., 2004. The capacity to aspire: Culture and the terms of recognition. Cult. Public Action 59–84.

Aredo, D., Tsegaye, W., La Rovere, R., Mwangi, W. 2008. Methodology: CIMMYT/SG 2000 Impact Assessment (IA) Project - Ethiopia. memo.

Asenso-Okyere, K., Mekonnen, D.A., Zerfu, E., 2013. Determinants of food security in selected agro-pastoral communities of Somali and Oromia Regions, Ethiopia. J. Food Sci. Eng. 3, 453.

Bandura, A. (The Psychologist (2009) (eds.)). 2009. "Social Cognitive Theory goes Global" talk by A. Bandura for the British Psychological Society's London and Home Counties Branch at Friends House, London, vol. 22, 6, June 504-506.

Barrett, C. 2010. Measuring Food Insecurity. *Science* Vol. 327 (825-828).

Berhane, G, Gilligan, D. O. Hoddinott, J., Kumar, N. and Taffesse, A. S. 2014. Can Social Protection Work in Africa? The Impact of Ethiopia's Productive Safety Net Programme. Econ. Dev. Cult. Change 63, 1–26. doi:10.1086/677753

Berhane, G, Hoddinott, J., Kumar, N. and Taffesse, A. S., 2011. The Impact of Ethiopia's Productive Safety Net Productive Safety Nets and Household Asset Building Programme: 2006-2010. IFPRI

Bernard, T., Taffesse, A. S., 2014. Aspirations: An Approach to Measurement with Validation Using Ethiopian Data. J. Afr. Econ. 23, 189–224. doi:10.1093/jae/ejt030

Bernard, T., Taffesse, A.S., and Dercon, S. 2008. Aspirations Failure and Well-Being Outcomes in Ethiopia: Towards an Empirical Exploration. Paper presented at Improving Institutions for Growth workshop, Oxford, UK, March 21.

Christiaensen, L. J. and Demery, L. 2007. Down to earth: agriculture and poverty reduction in Africa. The World Bank.

Clay, D. C., Molla, D., and Habtewold, D. 1999. Food aid targeting in Ethiopia: A study of who needs it and who gets it. Food Policy 24, pp. 391–409

Coll-Black, S., Gilligan, D.O., Hoddinott, J., Kumar, N., Taffesse, A.S., Wiseman, W., 2011. Targeting Food Security Interventions When "Everyone is Poor": The Case of Ethiopia‟ s Productive Safety Net Programme. ESSP II Work. 24.

Coates, J., Swindale, A. and Bilinsky, P., 2007. Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guide. Version 3. FANTA

Dalton, P.S., Ghosal, S., Mani, A., 2014. Poverty and Aspirations Failure. Econ. J. n/a–n/a. doi:10.1111/ecoj.12210

Dercon, S., Krishnan, P., 2000. In sickness and in health: Risk sharing within households in rural Ethiopia. J. Polit. Econ. 108, 688–727.

Devereux, S., Sussex, I., 2000. Food insecurity in Ethiopia, in: A DFID Ethiopia Seminar, London.

Dorosh, P & S. Rashid. (2012). Introduction. In Food and Agriculture in Ethiopia: Progress and Policy Challenges, eds. Published for the International Food Policy Research Institute, University of Pennsylvania Press.

EHRD (Ethiopia Humanitarian Requirements Document). 2016. Joint Government and Humanitarian Partners' Document. http://www.unicef.org/ethiopia/ECO_Ethiopia_HRD_2016.pdf (accessed Jan15, 16)

FAO, IFAD and WFP. 2015. The State of Food Insecurity in the World 2015. Meeting the 2015 international hunger targets: taking stock of uneven progress. Rome, FAO.

FAO, 2002. The State of Food Insecurity in the World 2001. Rome, FAO.

Feleke, S. T. Kilmer, R. L. and Gladwin, C. H. 2005. Determinants of food security in Southern Ethiopia at the household level. Agricultural Economics. Vol. 33 (3) 351-363.

GFDRE (Government of the Federal Democratic Republic of Ethiopia). 2007. Graduation Guidance Note. Addis Ababa: Food Security Coordination Directorate, Ministry of Agriculture and Rural Development.

GFDRE (Government of the Federal Democratic Republic of Ethiopia). 2009. Food Security Programme, 2010-2014. Addis Ababa: Ministry of Agriculture and Rural Development.

Gilligan, D.O. and Hoddinott, J. 2007. Is there Persistence in the Impact of Emergency Food Aid? Evidence on Consumption, Food Security, and Assets in Rural Ethiopia. American Journal of Agricultural Economics, Vol. 89, No. 2, pp. 225-242

Gilligan, D.O., Hoddinott, J., Taffesse, A.S., 2009. The Impact of Ethiopia's Productive Safety Net Programme and its Linkages. J. Dev. Stud. 45, 1684–1706. doi:10.1080/00220380902935907

Jones, A.D., Ngure, F.M., Pelto, G., Young, S.L., 2013. What Are We Assessing When We Measure Food Security? A Compendium and Review of Current Metrics. Adv. Nutr. Int. Rev. J. 4, 481–505. doi:10.3945/an.113.004119

Negatu, W. 2004. Reasons for Food Insecurity of Farm Households in South Wollo, Ethiopia: Explanations at Grassroots. BASIS CRSP.

Pangaribowo, E.H., Gerber, N. and Torero, M., 2013. Food and nutrition security indicators: a review. ZEF Working Paper Series N. 108.

Quisumbing, A. 2003. Food Aid and Child Nutrition In Rural Ethiopia. FCND Discussion Paper No. 158, IFPRI.

Ray, Debraj. 2006. "Aspirations, Poverty and Economic Change", in Banerjee, Abhijit V., Roland Benabou, and Dilip Mookherjee (eds.), Understanding Poverty, Oxford University Press, Oxford.

Strauss, J. and Thomas, D. 1995. Human resources: Empirical modeling of household and family decisions. volume 3 of Handbook of Development Economics, pp.1883–2023. Elsevier.

Swindale and Bilinsky (2006) Household Dietary Diversity Score (HDDS) for Measurement of Household Food Access: Indicator Guide. VERSION 2. FANTA

Tafesse, G. (2005). The Contributions of Agricultural Growth to Poverty Reduction in Ethiopia. Ethiopian *Journal of Economics* Vol. 14 (1) 2005: pp. 1-26

von Braun, J., Olofinbiyi, T., 2007. Famine and Food Insecurity in Ethiopia. Pinstrup-Andersen Fuzhi Cheng Eds Food Policy Dev. Ctries. Role Gov. Glob. Food Syst. Case Study 7 4.

Wiesmann, D., Bassett, L., Benson, T. and Hoddinott, J. 2009. Validation of the World Food Programme's Food Consumption Score and Alternative Indicators of Household Food Security. IFPRI DP 00870

World Bank. (2015). Ethiopia's Great Run. The Growth Acceleration and How to Pace It. Nov. 18. Draft, World Bank Group

World Bank Group. 2013. Ethiopia's Productive Safety Net Program (PSNP) Integrating Disaster And Climate Risk Management. Case Study. The World Bank.

WFP (World Food Programme). 2008. Food consumption analysis Calculation and use of the food consumption score in food security analysis. Technical Guidance Sheet.

Yamano, T., Alderman, H., Christiaensen, L., 2005. Child growth, shocks, and food aid in rural Ethiopia. Am. J. Agric. Econ. 87, 273–288.

Appendix

Table A.1. Summary statistics of variables used in the regressions (N=375)

Variable	Mean	Std. Dev	Min	Max
HFIAS score	0.469	1.904	0	16
Aspirations Head	0.161	0.608	-1.724	3.724
Aspirat.*INChange(2006-10)	-190.285	1241.538	-10658.7	4747.119
Female hh head+	0.101	0.302	0	1
HH head Age31-50+	0.493	0.501	0	1
HH head Age above51+	0.443	0.497	0	1
Head education: 0-4+	0.179	0.384	0	1
Head education: 5-8+	0.291	0.455	0	1
Head education: 8++	0.2	0.401	0	1
HH size(ln)	1.842	0.398	0	2.773
Dependency ratio	0.389	0.211	0	1
Off-farm income+	0.488	0.501	0	1
Change in per capita income (2006-10) in ETB	-813.016	1469.747	-8774.76	6343.799
Income per-adult equiv. in ETB	3310.824	2925.207	6.049137	24258.94
Value of assets (ln) in ETB	8.613	1.317	4.094345	13.265
Livestock holding(TLU)	8.066	5.250	0	35.052
Land in ha(ln)	0.917	0.628	-1.16475	2.822
Too much rain or flood+	0.088	0.284	0	1
Livestock diseases+	0.083	0.276	0	1
Increased input prices+	0.109	0.312	0	1
Death or loss of livestock+	0.093	0.291	0	1
Illness of head/spouse+	0.091	0.288	0	1
Illness of other family+	0.093	0.291	0	1
Road (minutes)(ln)	2.143	2.120	-6.908	4.788
Market(minutes)(ln)	3.812	0.941	0.001	5.598
Micro-finance institutio (minutes)(ln)	4.313	0.685	1.610	5.704
Health center(minutes)(ln)	3.705	0.853	0.001	5.481
Bako-Sire+	0.339	0.474	0	1
Hitossa-Tiyo+	0.333	0.472	0	1

+Binary outcome