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Self-produced food and vulnerability to poverty in Turkey

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Abstract

Investigating vulnerability to poverty is crucial to the development of forward-looking policies to fight poverty. I investigate the consumption of self-produced food as a strategy available to households to mitigate vulnerability in two dimensions: food and non-food consumption. First, I show that the consumption baskets of rural households that produce their own food are different and less expensive than those other rural households, which rely exclusively on retail food purchases. Second, I also show that while self-producing rural households are as vulnerable to basic needs poverty as other rural households, they are much less vulnerable to food poverty. These results underscore the importance of the ability to consume self-produced food as a vulnerability-mitigating strategy even in middle-income countries.

Keywords: Poverty lines; vulnerability; Turkey.

JEL classification: Q12, I32.

1. Introduction

Angus Deaton reminds us that "economic development was originally thought as economic growth, but in recent years it has increasingly come to be thought of as poverty reduction" (Deaton, 2006: 3). In order to address poverty reduction, both researchers and policy makers need to know who is poor, near-poor, or not poor. Standard poverty measures, for example those employed by Foster, Greer and Thorbecke (1984), which rely on poverty lines are very useful to policy makers because they present information about who is currently poor. However, such measures are limited in that

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they are static and *ex-post* measures (Naudé, et al., 2009) – they do not inform policy makers about "those who are not poor but may fall into poverty and those who will remain poor" (Zhang & Wan, 2009). Forward-looking policy makers should aim to design policies to help the vulnerable from falling into poverty and the chronically poor to escape the poverty trap. Even the non-poor are vulnerable to poverty because they can be subject to macro level shocks (climate change, financial crisis, etc.) or idiosyncratic shocks (such as illness or job losses). As a result of these concerns, some of the most cutting edge research in the development field has shifted focus to measuring vulnerability to poverty.

Poor and vulnerable people are not entirely defenseless against macro and idiosyncratic shocks even in the absence of specifically designed policies; there are strategies available that will reduce their vulnerability to poverty. This paper is primarily concerned with one such strategy available to most rural households: self-produced food. By consuming home produce, rural households can ensure access to some level of food, irrespective of agricultural market prices. In order to study the importance of consumption of self-produced food, I study vulnerability to both total consumption and food poverty. By studying vulnerability in two dimensions, I also show that a strategy (consumption of self-produced food) can be effective in one dimension (reducing vulnerability to food poverty) but not in another (total consumption poverty).

I split rural households into two groups according to whether or not they consume self-produced food in order to measure what role the consumption of home produce plays in poverty alleviation, and in reducing vulnerability to poverty, in rural households. I calculate both poverty indices (*ex-post* measures of well-being) and vulnerability to poverty (*ex-ante*) measures for undernutrition and expenditure levels for Turkey. In the first part of the empirical analysis, I demonstrate that conventionally calculated poverty lines and the corresponding poverty measures can be improved by taking into account how subsistence farmers' self-produced food is priced. When determining poverty lines and the corresponding poverty measures, all rural households are routinely lumped together. But self-produced food contributes a significant portion of total consumption in Turkey, especially in terms of dairy products, eggs, vegetables, and some cereal products (Table 1). The main contribution in the first half of this paper is to calculate separate poverty lines for both food-producing, and non-producing rural household, and to compare each type of rural household to the appropriate poverty line in calculating poverty measures. Once separate poverty lines are calculated for food and total expenditure, these lines are used to determine who is vulnerable to consumption and food poverty in the second part of empirical analysis.

In the second part of the empirical analysis, I follow Chaudhuri, et al., (2002), defining vulnerability to poverty at time t as the probability that a

household will be poor at time t+1[1], and employing the empirical model they developed to calculate vulnerability to total consumption and food poverty for Turkey. To my knowledge, this is one of the first papers to try to calculate vulnerability to total consumption and food poverty in Turkey at the household level using regression techniques. (Şeker (2011) is another example of a vulnerability study focusing on Turkey).

The rest of the paper is organized as follows: Section 2 on the theoretical background reviews briefly the agricultural household literature and shadow prices; Section 3 describes theories of poverty measurement, vulnerability calculation and the empirical methodology followed in the estimation of vulnerability; Section 4 explains the data set and presents descriptive statistics; Section 5 presents the results; Section 6 concludes by recapping the findings.

2. Theoretical background

2.1. Agricultural households

Agricultural households very often supply directly the major inputs – land and labor – which are necessary for agricultural production. Most of the time, supplies of these inputs are determined by their shadow prices. If there were no transaction costs leading to markets functioning imperfectly, we could assume that production and consumption decisions are made sequentially: production is decided upon first, and consumption follows. As Sadoulet and de Janvry (1995) write:

> As is typical when all markets work and there are no transaction costs, it is immaterial to whether the household consumes its own products or sells them to buy what it needs to consume…. Under these conditions, the household behaves *as if* production and consumption/work decisions were made sequentially… there is separability whenever prices are exogenous and markets are used, even if sale and purchase prices are not identical. When a household model is separable it can be solved recursively in two steps (p. 145) (italics are added).

This does not necessarily mean that production and consumption decisions are always sequential; instead, it means that production and consumption decisions can be studied separately.

A farmer produces a commodity – which is then traded for a price – taking into account market wage, input prices and farm-firm characteristics such as fixed capital costs and farm size. Given exogenous prices, the farmer determines how much to produce, how many inputs to use, and how much labor to exert in order to maximize profits. Profits are the *hinge* between production and consumption decisions because farm profits are a part of

[1] Each household has a positive probability of being poor in the next period, but I focus on highly vulnerable households – those whose probability of being poor is more than 50 percent at time t+1.

household income and hence affect consumption decisions via budgetary constraints. Households maximize utility by allocating their full income among agricultural goods, manufactured goods, and leisure according to household characteristics such as household size, age, and education; and they remain subject to total income and time constraints.

In practice, incomplete markets are generally the rule rather than the exception in rural areas in developing countries. In describing an incomplete market Sadoulet and de Janvry (1995: 149) note: "a market may fail for a particular household when it faces wide price margins between the low price at which it could sell a commodity or the factor and the high price at which it could buy that product or factor". Complete self-sufficiency of the idealized peasant is one extreme of incomplete markets. In this case peasants produce all of the consumption needs of a household by employing only the productive factors (land and labor) available within the household.

According to Sadoulet and de Janvry (1995: 149-150) the most common reasons for incomplete markets are:

(i) transaction costs due to poor infrastructure, high marketing costs due to merchants' local monopoly power, and supervision costs of hired labor;

(ii) shallow local markets because of a high covariation between household supply and prices (during the harvest time prices are low because everybody is selling in the locale and during the low season prices are high because of low supplies);

(iii) due to price risk and the risk aversion of farmers, sale prices are discounted negatively and purchase prices are revised upward to hedge against risk;

(iv) and finally, limited access to working capital means that the budget balance becomes a constraint, and this leads to self-sufficiency because actions requiring cash outlays, such as hiring outside labor or using fertilizer implicitly, carry financing costs, while cash-generating activities – even if seemingly unprofitable, such as selling milk – are pursued to ease cash constraints, especially in the lean season.

Due to market imperfections, exogenous market prices do not accurately reflect the full opportunity costs of goods and services. In the presence of imperfect markets, some goods become non-tradable, with prices determined internally by the household; hence decisions about production and consumption are no longer separate: they are decided jointly. The next section discusses the implications of shadow prices for this paper.

2.2. Shadow prices

Recent household food consumption and food demand studies pertaining to Turkey (Şengül, 2004; Şengül and Tuncer, 2005; Akbay et al., 2007) implicitly assume that households behave as mere price takers in food consumption. However, Tekgüç (2012) shows that rural households consuming self-produced food in Turkey decide what to produce and

consume jointly, i.e., according to shadow prices. This finding is directly relevant to poverty analysis as households' consumption of self-produced food indicates that these households value those food items more than the wholesale price. If not, they would have sold some on the market and obtained cash, which is preferable to in kind income all other things being equal. However, due to transaction costs, all else is not equal. For this reason, the theory under-girding the methodology of the Turkish State Institute of Statistics (TurkStat) is faulty.[2] The correct inference requires calculating households' shadow prices, which demands data both on consumption patterns and production factors, and is not available in the Household Budget Surveys (HBS) for Turkey. Imputing regional wholesale prices is a practical solution, but underestimates total consumption levels for those households which consume a substantial amount of home-grown food.

Food produced and consumed within the household obviously has no market price. Because researchers impute local sale or wholesale prices, as opposed to retail prices, to determine the monetary value of all consumption, self-produced food accounts for a lower share of total food spending than its share in total calorie supply. Although imputing the regional retail prices of substitute food products is an alternative to regional wholesale prices, this strategy has proven difficult to implement. TurkStat (2003) includes a list of almost 300 food items, whereas households report consuming 66 different items on average. Imputing average regional retail prices for so many items is a very arduous process. More importantly, the prevalence of self-produced food is not evenly distributed among regions or across food items. Rather, it is concentrated in certain commodities (especially dairy, leafy greens and certain cereals) and regions (Western and Eastern Black Sea, North East, and South East). In practice, this implies that for regions and food items for which self-production is especially significant, e.g. milk in the Eastern Black sea region, there are too few observations of retail prices to obtain reliable estimates. Finally, the smallest regional unit in the survey covers several provinces, and hence survey data on average retail prices may not provide reference prices relevant to rural households producing their own food.

As a result, instead of imputing retail prices to monetize self-produced food, I calculate one poverty line for those rural households which consume home produce and another poverty line for rural households which rely entirely on market purchases for food (hereafter "other rural"). A third poverty line is established for urban households. Section 3.1 explains the poverty line calculation in detail.

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[2] TurkStat methodology is to impute either the local sale price (retrieved from the household itself) or if the household does not know the local price, then wholesale price for the region for consumption from self-production. I verified with TurkStat officials that wholesale prices are imputed for self-produced food. The imputed wholesale prices are determined according to either the declaration of interviewed households or best guess estimates of interviewers (private correspondence with Ö. Sarıca, household statistics team leader, (February 2010)).

3. Poverty measurement and vulnerability calculation

Determining poverty lines is a precondition of calculating vulnerability to total consumption and food poverty. Poverty lines are used as benchmarks to demarcate the poor from the non-poor, and are necessary for determining which households are vulnerable in the following periods. The next section, briefly discusses establishing poverty lines and discusses vulnerability to poverty in detail.

3.1. Poverty lines

Poverty lines are regularly calculated separately for urban and rural households given a sufficiently large sample size and a sampling method amenable to representation. Table 2 shows that the typical food basket of self-producing rural households in Turkey differs from that of other rural households, which exclusively depend on retail purchases because they face different prices (i.e. shadow prices for some food items and retail prices for others).[3] Since self-producing rural households do not decide which food items to consume solely on a retail food price basis, it follows that the corresponding food basket used for calculating their particular poverty line should not be based on retail prices alone.

I closely follow the methodology of the *Turkey Joint Poverty Assessment Report* (WB and TurkStat, 2005)[4] to construct the basic needs poverty line for Turkey, except for introducing one major improvement. The Joint Report calculates one poverty line for all of Turkey because it uses a smaller sample collected in 2002. TurkStat 2003 survey is a much larger data set that allows for calculating separate poverty lines for urban, self-producing rural, and other rural households.

In order to price the representative food budget, I consider the three household types in turn and determine the mean price paid by (or imputed for) second-quintile households in each group. Next, I multiply the food basket by a constant (2.48, inverse of 40.3 percent)[5] to account for the non-food needs of households. By multiplying all sub-groups with the inverse of 40.3 percent, I ensure that the corresponding difference in poverty lines is entirely due to corresponding prices and differences in food baskets.

Finally, I divide total consumption and food spending by household size (adjusted for adult equivalents) in order to calculate per capita total consumption and per capita food expenditure. In order to adjust household size for adult equivalents, I again follow TurkStat and WB in the Joint Report for comparability:

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[3] Table A2 in the Supplementary Materials and the preceding discussion presents formal tests for the difference of consumption baskets.

[4] The report was jointly prepared by World Bank's Human Development Sector Unit, Europe and Central Asian Region and Turkish State Institute of Statistics; hereafter Joint Report.

[5] TurkStat reports that in 2003, on average, food accounts for 40.3 percent of total spending for households just above poverty line. The actual food share of each sub-group differs from the 40.3 percent. I believe TurkStat/WB prefer to multiply the food basket with inverse of 40.3 percent simply as a short-cut means of determining a complete consumption basket.

$$AE\_ADJ_i = (A_0 + C_0)\left(\frac{A_i + \alpha C_i}{A_0 + \alpha C_0}\right)^{\theta} \quad (1)$$

where AE_ADJ is adjusted adult equivalent; subscript *i* stands for household numbers; A_0 is the number of adults in a modal household (two); C_0 is the number of children in the modal household (two); α and θ are constants (respectively chosen as 0.9 and 0.6 by TurkStat and WB officials) where α is the adult weight of each children in the household and θ functions as an economies of scale parameter since it is less than 1. In this formulation, the adjusted adult equivalent of the four-person modal household is still four simply because the value of the fraction is equal to one. The adjusted equivalent of a one-person household is 1.8, hence a four-person household's expenses is only 2.22 (=4/1.8) times greater than that of a one-person household. The adjusted equivalent of an eight-person household (four adults and four children) is 6.1 (only 1.5 times more than four-person household).

TurkStat and WB's adult equivalence formula is rather unconventional, so in order to check the robustness of this methodology I also calculate per capita total consumption and per capita food expenditure using i) household size, and ii) a modified OECD scale.[6] On the one hand, dividing total household consumption by household size assumes no economies of scale in household consumption. On the other hand, the OECD modified scale assumes a very high degree of household economies of scale. On an OECD-modified scale, a single person household's score is 1 and a nine-person household's score is 4.4. Table 3 presents basic needs and food poverty rates calculated according to three alternative adult equivalence methodologies.

3.2. Vulnerability to poverty

From year-to-year, some households are likely to move into and out of poverty. Among the poor, some households are likely to be chronically poor due to a lack of assets, education, or presence of debilitating illness, while others are transitionally poor due to unfavorable weather or life-cycle characteristics (such as young adults at the beginning of their careers). Hence from a policy perspective, it is important to identify not only who is currently poor, but also who is vulnerable to poverty.

Dercon's (2001: 17) in his framework for analyzing vulnerability to poverty points out that households have control over labor (human capital), land (physical capital), family networks (social capital), and common and public goods (such as surrounding grazing areas) that they can employ or sell to derive income and increase or sustain their well-being. Households also face numerous risks to the realization of well-being: death and illness

[6] OECD-modified scale: 1 for the first adult, 0.5 for each additional adult and also for each children aged 14 or over, and 0.3 for each children younger than 14. Table A4 presents a comparison of alternative household adult equivalence scales for many household sizes.

can limit employment opportunities and returns to labor; harvests can decline due to climatic shock; governments can reduce public provision of certain services, including public health care, basic education, etc. Nevertheless, households are not entirely powerless in the face of their vulnerabilities and take steps to reduce exposure and/or mitigate risk. Self-produced food is a risk-mitigating strategy that allows households to eliminate the food price risk to which they are exposed when converting income into desired goods and services. By consuming home produce, households safeguard their access to food no matter what happens in produce markets. This is particularly relevant as food prices can swing significantly in Turkey. For example, between May 2009 and May 2010, beef prices increased by two-thirds. In the same period, dairy products price levels increased by roughly 20 percent.[7]

Vulnerability to poverty is seldom studied empirically due to methodological difficulties in comparing poverty calculations. Ideally, vulnerability to poverty would be studied using panel data sets allowing researchers to identify households that move into and out of poverty (or remain permanently poor). Panel data sets would allow for observations of changes in consumption and food from one period to next, and to model the impact of specific shocks. Şeker (2011) uses TurkStat's Survey on Income and Living Conditions to evaluate basic needs poverty, however, that data set does not contain information on food consumption (especially data on the quantity and source of food). TurkStat's 2003 Household Budget Survey (TurkStat 2003) is the most recent Turkish data set containing information on both the quantity of food consumed and source of food (market vs. home produce). However, TurkStat (2003) is only a cross-section data set. Despite the limitations attendant on using a cross-sectional data set, I make a first attempt to calculate vulnerability to poverty in Turkey.[8]

I choose consumption per capita for basic needs poverty, and monthly spending on food for food poverty, for the outcome-based definition of vulnerability. I adopt the poverty lines calculated in Section 5.1 as the 'socially defined minimum levels' and follow the empirical model developed by Chaudhuri, et al., (2002) to study vulnerability to poverty when only a single year of cross-section data is available, and assume that household characteristics will not change significantly in the following year (in this, I follow the notation and formulas presented in Haughton and Khandker (2009)). The vulnerability to negative shocks probably increases as the time horizon lengthens beyond a year,[9] so limiting the study to only

[7] Author's own calculations from TurkStat price indices.

[8] An alternative to the econometric methods employed here is to define vulnerability based on a single variable. For example, TurkStat classifies households at poverty risk if their income is less than 50 percent of median income. Alternatively, Davidova, et al., (2009: 735) classify a household as vulnerable if the dependency ratio is three or more.

[9] Pritchett, et al., (2000) study the vulnerability for next few years. Dercon (2005: 9) estimates that during 1994 -1997 in Ethiopia 78 percent of rural households have experienced at least once harvest failure, 40 percent labor problems (illness, death), 39 percent oxen problems (death, illness).

the following year will likely give us a conservative estimate of real vulnerability.

Due to above methodology, substantial number of households, who are not poor according to basic needs poverty line are identified as food poor because their monthly spending on food is less than food poverty line. In other words, some households (especially urban) whose total spending is above the basic needs poverty line, choose either to spend a smaller share of their income on food or they consume less than 2,100 calories a day. As a result they are deemed food poor by chosen methodology. Alternatively, TurkStat prefers to call a household food poor only if its total consumption expenditure is less than cost of food basket (Table A10 in Supplementary Materials presents results for TurkStat methodology. Even though the results are very different, the ranking of sub-groups is the same (self-producing rural < urban < other rural)). However, TurkStat methodology is very extreme. The food basket constructed with Basic Needs methodology is a very modest one. It is the average basket of 2nd quintile households where more than 50 percent of calories are sourced from cereals category and roughly 10 percent from animal products. Şengül and Tuncer (2005) construct reference food basket from Hacettepe University Medical School nutrition textbook where both cereals and animal products contributes 30 percent a piece to total calories. Hence, I think it is very significant that 44 percent of all households are unable to meet a very modest food basket. For these reasons, I prefer to keep food poverty table as it is and calculate the food vulnerability accordingly.

3.3. Empirical model for vulnerability to poverty

Formally, the problem can be stated as follows: if the household's current consumption is $c_{h,t}$ and if the poverty line is *z,* then a household is classified as poor if $c_{h,t} \leq z$ and vulnerability to poverty in the next year can be defined as:

$$v_{h,t} = \Pr(c_{h,t+1} \leq z) \tag{2}$$

where $c_{h,t+1}$ is the expected consumption level of the household in the next period, which is unobservable using a cross-section data set. In order to determine $c_{h,t+1}$, ideally one should have information about the assets the household could sell for consumption smoothing and the risk-associated probabilities that each household faces during the next year, such as a potential drought, illness, etc. One also needs information about the support systems on which each household can rely in case of a negative welfare shock. In other words, the ideal model would be:

$$c_{h,t} = c(X_h, \beta_t, \alpha_h, e_{h,t}) \tag{3}$$

where X_h are observable household characteristics, such as education or assets owned; β_t are common (macro) shocks, such as financial instability; α_h are unobserved, time-invariant household characteristics, such as family networks; and $e_{h,t}$ is the error term that is supposed to account for idiosyncratic shocks that can affect one household but not necessarily others nearby, for example, a non-communicable illness afflicting a household member.

Obviously these are insurmountable data requirements, especially given a cross-section data set. Chaudhuri, et al., (2002) simplify the data requirements by the following means: if one knows the expected level of per capita consumption in the next period, $E(c_{t+1})$ the variance of expected per capita consumption in the next period, σ^2 and the poverty line, *z,* and if one assumes that expected consumption per capita follows a known distribution (such as the log-normal distribution) than one can estimate vulnerability to poverty for the next period. For example, if the expected value of per capita consumption for a household for the next period is 272 Turkish Lira (TL), variance is 2,500, the poverty line is 207, and if one assumes that shocks are normally distributed, then the probability of being poor is 9.6 percent.

$$\begin{aligned} &\ln c_{h,t} = X_h * b + e_h \\ &where\ e_h : N(0, X_h\theta) \end{aligned} \tag{4}$$

Equation 4 is a simplified version of Equation 3 given the data availability from a single cross-section data set.[10] One has to assume away the macro level shocks, and one cannot control for unobservable household characteristics, such as family networks, that a household can rely upon in times of need.

The dependent variable in the simplified model (Equation 4) is the natural logarithm of adult equivalent per capita monthly consumption (or adult equivalent per capita monthly food spending). The variance of the error term is not constant, but assumed to depend on household characteristics; hence in the second step, I regress squared values of e_h on the same independent variables from step one to obtain the estimates for $\hat{\theta}$, so that I can estimate the idiosyncratic variance $(\sigma^2 = X_h\hat{\theta})$ for each household.

[10] Zhang and Wan (2009) estimate future income level both by regression methods (similar to Equation 4, but for panel data using fixed effects) and by taking weighted average of observed income levels in the past (they have panel data for 1989, 1991, and 1993 for rural Chinese households). They conclude that the weighted average of 1989 and 1991 income levels is a better predictor of 1993 income than predictions from regression results. However, we do not have panel data that will allow us to observe past income or expenditure levels.

Once I obtain these variables, I can estimate the vulnerability to poverty for each household $(\hat{v}_h)$ with Equation 5, where Φ is the cumulative density function of the standard normal distribution[11]:

$$\hat{v}_h = \Pr(\ln c_h < \ln z / X_h) = \Phi\left(\frac{\ln z - X_h\hat{b}}{\sqrt{X_h\hat{\theta}}}\right) \quad (5)$$

Pritchett, et al., (2000) points out that the dependent variable, consumption, is measured with substantial error in household surveys. As a result of measurement error, they argue that the movement into and out of poverty is overstated and, as a related matter, the estimated variance, σ^2, is overstated, too. Consequently, they revise their estimates of variance downward by 30 percent. In order to estimate measurement error, they estimate a bivariate Engel Curve where the dependent variable is food share in total expenditures and the sole explanatory variable is the natural logarithm of expenditure per capita with OLS. In the second step, they instrument the natural logarithm of expenditure per capita with all other independent variables (in this case all independent variables in Equation 4, see Section 5.2 for the empirical model). Then they define the measurement error as one minus the ratio of coefficient estimates of OLS to IV: $1-(\beta_{OLS}/\beta_{IV})$. I follow this convention suggested by Pritchett, et al., (2000), and estimate β_{OLS} as -0.0905 and β_{IV} as -0.1369 for TurkStat (2003), and hence measurement error in this sample is 34 percent for the whole sample.[12]

4. Data and descriptive statistics[13]

I use TurkStat (2003), which is a cross-section data set of 25,764 households, of which 7,486 reside in rural areas. TurkStat classifies 4,154 of those rural households as consuming home produce to some extent, and the remaining rural households (3,332 ones) as other rural.[14] Self-produced food accounts for seven percent of total available food calories in Turkey as a whole, and roughly 19 percent of rural food calories (Tekgüç, 2012: Table 1).

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[11] Table A9 in Supplementary Materials presents the expected vulnerability scores for various hypothetical households.

[12] The measurement error is 24 percent for urban households; 61 percent for self-provisioning rural households; 31 percent for other rural households.

[13] For space considerations, only the descriptive statistics for self-provisioned food is presented in the paper, the rest are available upon request. Table A3 in Supplementary Materials presents mean values for food expenditures for sub-groups.

[14] There are 656 urban households who consume some amount of home produce but the share of self-produced food is very small (Table 1: less than 1 percent, except for dairy products). Moreover, the number of those households is insufficient to produce reliable estimates for a fourth group 'urban self-producing,' so I grouped them with the rest of urban households.

Table 1 shows the percentage of non-zero purchases and summary statistics for the food budget share of self-produced products. Two characteristics about self-production stand out. First, self-production is concentrated around several commodities. On the one hand, there is no self-production of highly-processed products like sugar and vegetable oils; on the other hand, 64 percent of fluid milk, 81 percent of yogurt, 73 percent of butter, 42 percent of cheese, 28 percent of eggs, 39 percent of other grain products, and roughly 11 percent of fruits and vegetables consumed in rural areas are self-produced (percentages are calculated in caloric terms). Second, retail and imputed price differentials vary depending on the product. For dairy products, the imputed price is roughly 74 percent of retail price. In the fruits, vegetables, and "other grains" categories, the imputed prices are roughly 70 percent of retail prices. However, for products where highly industrialized substitutes are available (e.g.: chicken and eggs), retail prices are somewhat lower than imputed prices.

Table 1
Percentage of Self-Producing Households and Share of Self-Produced Food in Total Consumption of Each Food Group (Calculated in Caloric Terms)

	Entire sample		**Urban only**		**Rural only**	
Food Groups[a]	Self-producing % of hhs	Share of own-prod. in cons. (%)	Own producing % of hhs	Share of own prod. in cons. (%)	Self-producing % of hhs	Share of own-prod. in cons. (%)
Cereals [b]	8.2	8.7	0.5	0.5	27.0	23.3
Meat	1.4	1.7	0.2	0.2	4.3	5.9
Vegetables	9.0	4.2	1.9	0.7	26.3	11.2
Fruits	3.9	3.6	0.9	0.9	11.3	10.1
Dairy & egg	14.9	23.6	1.7	2.0	47.2	59.7
Sugar etc.	0.5	0.5	0.1	0.1	1.5	1.2
Tea & Coffee	0.1	0.0	0.0	0.0	0.4	0.1

a: There is no self-produced vegetable oils, non-alcoholic beverages and other food groups.
b: Cereals includes both bread and flour used for making bread at home.
Author's own calculations from TurkStat (2003).

5. Results

5.1. Consumption and food poverty in Turkey

Table 2 presents the poverty lines calculated according to the basic needs approach. All four food baskets contain 2,100 calories a day – an amount similar to that in the Joint Report (WB and TurkStat, 2005). The cereals food groups account for slightly more than half of the calories in every specification. The distribution of consumption indeed varies with urban / rural differences, and depending on whether the rural households being examined are self-producing or not. Second quintile self-producing rural households consume both more cereals – the cheapest source of

calories – and more dairy products – a relatively expensive source of calories (even when sourced from home produce). The net result is a monthly food budget of 64 Turkish Lira (TL), 17 percent less than other rural households' food budget (77 TL). After calculating the minimum food budget, I calculate two alternative poverty lines. In the first case, I assume that the food share is constant at 40.3 percent for each sub-group. The results are presented in 'identical food share' row. I use these poverty lines in the first three columns of Table 3. In the second case, I multiply every sub-group with the inverse of its own food basket share. The results are presented in the 'varying food share' row, which are used in the basic needs calculation in Column 4 of Table 3.

Table 2
Representative Food Basket Providing 2,100 Calories Per Day

	Urban		Rural		Self-producing Rural		Rural other	
Food group	**kg**	**daily cost**	**kg**	**daily cost**	**kg**	**daily cost**	**kg**	**daily cost**
Cereals	0.38	0.50	0.35	0.39	0.34	0.34	0.37	0.46
Meat	0.03	0.15	0.02	0.09	0.02	0.07	0.03	0.13
Fats and oils	0.04	0.09	0.03	0.08	0.03	0.08	0.04	0.09
Vegetables	0.34	0.33	0.29	0.27	0.28	0.26	0.30	0.30
Fruits	0.16	0.15	0.13	0.12	0.12	0.10	0.14	0.14
Dairy and egg	0.15	0.19	0.18	0.19	0.21	0.19	0.13	0.16
Sugar, jam and honey	0.05	0.11	0.05	0.11	0.05	0.11	0.05	0.11
Tea and coffee	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01
Beverage	0.02	0.03	0.01	0.02	0.01	0.01	0.01	0.02
Other food	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	1.16	1.55	1.07	1.27	1.06	1.17	1.08	1.41
Days in a month		30.417		30.417		30.417		30.417
Food poverty line, TL		47.2		38.7		35.6		42.8
Food share		40.3%		40.3%		40.3%		40.3%
Identical food share monthly poverty line, TL		117.0		96.0		88.3		106.2
Food share		33.3%		42.0%		45.6%		38.8%
Varying food share monthly poverty line, TL		141.8		92.0		77.9		110.3
Mean expenditure, TL		272		174		159		187
Sample size		18,278		7,486		4,154		3,332

The average exchange rate for 2003 is 1.5 TL for $1 at current prices, and 0.732 TL for $1 at PPP.
Author's own calculations from TurkStat (2003).

Table 3 shows the headcount poverty rates calculated using the three poverty lines: urban, rural self-producing and other rural.[15] I present three

[15] TurkStat reports overall poverty rate for 2003 as 28.1 percent for Turkey; 22.3 percent for urban areas and 37.1 percent for rural areas. TurkStat's findings are somewhat higher than findings in this study both for urban and rural areas.

alternative household size adjustments as robustness checks. Dividing total consumption and food budgets by household size (first column) is akin to assuming no economies of scale in household consumption. On the other extreme, OECD method assumes a significant amount of economies of scale in household consumption and as a result produces unbelievably low poverty rate estimates. I believe the TurkStat methodology for adjusting household size –which falls between the two extremes but closer to the no-economies-of-scale end – is the most reasonable available. In the first three columns (see the top half of Table 3), I assume an identical food share (40.3 percent) for all sub-groups; the corresponding individual poverty lines are as stated in the relevant row in Table 2 (similar to TurkStat methodology). In column 4 of Table 3, I use varying food basket shares for each sub-group and the poverty lines as stated in the relevant row of Table 2. This transformation leads to a higher income poverty threshold in urban areas. The reason for this improbable result is a lower urban food share among urban households (33.3 percent instead of 40.3 percent) and multiplying their food budget by the inverse of 33.3 percent results in a higher poverty line (141.8 TL instead of 117 TL). In the light of this improbable finding, I proceed with using TurkStat methodology for household size adjustment and identical food shares.

Table 3
Consumption and Food Inadequacy with Different Specifications

Overall Poverty	**Headcount Poverty Rate with alternative household size adjustments**			
	Household Size	**TurkStat***	**OECD**	**TurkStat & diff. food share**
Urban	0.23	0.22	0.06	0.32
Rural	0.31	0.31	0.10	0.29
Rural self-producing	0.33	0.30	0.09	0.23
Rural other	0.30	0.32	0.10	0.34
Total	0.26	0.26	0.08	0.31
Food Inadequacy	**Headcount Poverty Rate with alternative household size adjustments**			
	Household Size	**TurkStat**	**OECD**	
Urban	0.45	0.47	0.12	
Rural	0.39	0.38	0.10	
Rural self-producing	0.35	0.30	0.07	
Rural other	0.43	0.45	0.13	
Total	0.43	0.44	0.11	

* Differences between the two-means tests reveal urban and rural basic needs poverty and food inadequacy rates are statistically different with a 99 percent confidence interval. Basic needs poverty rate estimates for self-provisioning and other rural household estimates are not statistically different from each other, while food inadequacy rate estimates for self-provisioning and other rural households are statistically different. Relevant tests are presented at Table A6 in Supplementary Materials. Table A5 in Supplementary Materials presents alternative poverty measures (i.e. poverty gap and squared poverty gap) when TurkStat equivalence scales are used. Poverty gap and squared poverty gap measures are parallel to headcount poverty rate for this data set.

The cumulative distribution of monthly per capita spending for rural households (adjusted for household size using TurkStat methodology, separately for self-provisioning and other rural households) is presented in Figure A1 in Supplementary Materials. As can be seen from the graph, other rural households have higher consumption levels throughout the left tail of the distribution curve, and hence a higher incidence of poverty among those households is entirely due to much higher poverty threshold. Similarly, Figure A2 shows the cumulative distribution of spending on a typical food basket for rural households. The food expenditures by the two rural groups track each other very closely, hence the difference in food poverty/inadequacy rate is solely due to where the poverty line drawn for each sub-group respectively.

5.2. OLS estimation results for total consumption and food expenditure

In constructing the empirical model, I start with the multivariate analysis in the Joint Report (WB and TurkStat, 2005: 40). The variables in common in the Joint Report and this study include: the number of children in the household; age, education level, and gender of household head; whether the household resides in a rural or urban area; dummy variables for the occupational category (employer, self-employed, salaried, day laborer) of employed members of household (not only household head but all members of household); and whether any member of the household is covered by the social security system that gives access to heavily subsidized health care and eventual retirement benefits. I add "any member of hh, strenuous labor" to account for people working in strenuous jobs as a proxy for low paid jobs. I also add dummy variables for regions (Istanbul is the omitted region). Finally, the 2003 household budget survey has some information on assets, so I include the natural logarithm of land value to the model, to control somewhat for assets on which households can rely to smooth consumption in case of a negative shock.

I estimate Equation 4 both for per capita total consumption and for per capita food expenditure, and also separately for whole sample: urban, self-producing rural and other rural households. Estimates for total consumption are presented in Table A1a and estimates for food expenditure are presented in the Table A1b in Supplementary Materials for space considerations. Most of the results for the OLS model are as expected. Per capita expenditure and food spending (adjusted with TurkStat adult equivalence) are higher for better educated, salaried, urban households. Istanbul (the wealthiest and most expensive region is omitted from the model) has the highest level of total spending and food consumption (with the exceptions of the Central and Southeast regions in the whole sample). Households with members who are unpaid workers (who are overwhelmingly rural females) and who possess more valuable land, spend more on food most likely because for those households the shadow price of self-provisioned food is cheaper: such households have access to both labor and land.

5.3. Vulnerability to total basic needs poverty[16]

After obtaining coefficient estimates for Equation 4, I perform the additional steps described in Section 3.3 to obtain estimates on vulnerability to poverty, $\hat{v}_h$, as shown in Equation 5. Table 4 summarizes the results. If a household's probability of becoming poor (for the currently non-poor), or continuing to live in poverty, is more than 50 percent, those households are labeled highly vulnerable. If a household's probability of becoming poor (for the currently non-poor), or continuing to live in poverty is less than 26 percent (which corresponds to the overall poverty rate from Table 3), those households are labeled not vulnerable. Finally, if a household's probability of becoming poor (for the currently non-poor), or continuing to live in poverty is between 26 percent and 50 percent, those households are labeled moderately vulnerable. These lines are arbitrary; as even households labeled not vulnerable have a positive chance of falling into poverty during the next period.[17] On the other hand, the labels are helpful in revealing whether vulnerability is concentrated among any sub-groups of population.

The sampling methodology for TurkStat 2003 assumes approximately 16.75 million households. Hence 1,001,048 households who are currently poor but not vulnerable to poverty in the next period constitute six percent of total households.[18] Unsurprisingly, the current poor are more likely to be highly vulnerable to poverty in the next period (two million out of 4.3 million compare to 882 thousand out of 12.5 million in the whole sample). In urban areas, only 16 percent of (currently poor (11 percent) plus non-poor (5 percent)) all households are highly vulnerable to basic needs poverty, compared to 18 percent of self-producing rural households and 23 percent of other rural households. Even if other rural households are more likely to be highly vulnerable to basic needs poverty in the next period, the overall profile of self-producing and other rural households are pretty similar.

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[16] Table A7 and A8 in Supplementary Materials are simplified versions of Tables 4 and 5, respectively.

[17] Zhang and Wan (2009) estimate vulnerability in rural China using three waves of a panel data: 1989, 1991, and 1993. They use the data from 1989 and 1991 to estimate vulnerability to poverty and compare their findings to observed poverty in 1993 data. They conclude that setting the vulnerability threshold at 50 percent probability yields best estimates compare to 100 percent threshold or overall poverty rate in the data set (26 percent for 2003 data for Turkey).

[18] Similarly, sampling methodology assumes 10.7 million urban households; 2.8 million self-provisioning rural households and 3.3 million other rural households.

Table 4
Vulnerability to Basic Needs Poverty in Turkey, 2003

Next period	Current poor				Current non-poor			
Whole sample	**# of households**	**% of total**	**[95% Conf. Interval]**		**# of households**	**% of total**	**[95% Conf. Interval]**	
Not vulnerable	1,001,048	6%	945,724	1,056,373	9,202,727	55%	9,147,402	9,258,051
Moderately Vulnerable	1,237,940	7%	1,185,944	1,289,935	2,379,418	14%	2,327,423	2,431,414
Highly vulnerable	2,040,766	12%	1,994,234	2,087,298	882,596	5%	836,064	929,128
	4,279,754	26%			12,464,741	74%		
Urban								
Not vulnerable	547,208	5%	509,885	584,531	6,421,350	60%	6,384,027	6,458,673
Moderately Vulnerable	661,486	6%	626,172	696,800	1,347,843	13%	1,312,529	1,383,157
Highly vulnerable	1,190,656	11%	1,158,624	1,222,689	518,320	5%	486,287	550,352
	2,399,350	22%			8,287,513	78%		
Self-producing rural								
Not vulnerable	275,589	10%	247,540	303,638	1,342,793	48%	1,314,744	1,370,842
Moderately Vulnerable	215,829	8%	194,473	237,185	447,477	16%	426,121	468,833
Highly vulnerable	346,908	12%	327,267	366,548	163,283	6%	143,643	182,924
	838,326	30%			1,953,553	70%		
Other rural								
Not vulnerable	199,048	6%	168,539	229,557	1,523,550	48%	1,493,041	1,554,059
Moderately vulnerable	283,941	9%	255,815	312,067	450,450	14%	422,324	478,576
Highly vulnerable	528,105	17%	501,880	554,330	200,523	6%	174,298	226,748
	1,011,094	32%			2,174,523	68%		

5.4. Vulnerability to food poverty

I perform a similar analysis for vulnerability to food poverty when the cut-off is the food poverty line. Since the overall food poverty rate, 44 percent, is close to the cut-off point for the highly vulnerable (50 percent), I separate the sampled households only according to whether or not they are highly vulnerability (more than 50 percent) or moderately vulnerable (less than 50 percent) as Zhang and Wan (2009) suggests. The results are presented in Table 5. 40 percent of all households are vulnerable to food poverty in the next period. Among rural households, I find that vulnerability to food poverty differs greatly between self-producing and other rural households. Not only is food poverty much more prevalent among other rural households in the current period (45 percent among other rural households vs. 30 percent among self-producing rural households), but 64 percent (950 thousand out of 1.5 million) of these food poor other rural households are highly vulnerable to food poverty in the next period. Moreover, roughly 27 percent (489 thousand out of 1.78 million) of currently non-poor other rural households are highly vulnerable to food poverty. Overall, 44 percent of all other rural households (poor and non-poor combined) are highly vulnerable to falling below the food poverty line

irrespective of their current classification, compared to 13 percent of self-producing rural households. These findings lend support to the hypothesis that control over productive assets allows some rural households not only to escape the deepest rungs of food poverty, but also to reduce the risk of experiencing food poverty in subsequent periods due to idiosyncratic shocks.

Table 5
Vulnerability to Food Poverty in Turkey, 2003

Next period	**Currently poor**				**Currently non-poor**			
Whole sample	**# of households**	**% of total**	**[95% conf. Interval]**		**# of households**	**% of total**	**[95% conf. Interval]**	
Moderately Vulnerable	2,741,018	16%	2,656,006	2,826,029	7,305,547	44%	7,220,536	7,390,559
Highly Vulnerable	4,608,471	28%	4,538,525	4,678,418	2,089,459	12%	2,019,512	2,159,405
	7,349,490	44%			9,395,005	56%		
Urban								
Moderately Vulnerable	1,595,528	15%	1,534,878	1,656,178	4,187,867	39%	4,127,217	4,248,517
Highly Vulnerable	3,444,722	32%	3,390,375	3,499,068	1,458,747	14%	1,404,401	1,513,094
	5,040,250	47%			5,646,614	53%		
Self-producing rural								
Moderately Vulnerable	607,803	22%	568,175	647,430	1,840,252	66%	1,800,625	1,879,880
Highly Vulnerable	216,048	8%	199,596	232,500	127,777	5%	111,325	144,229
	823,851	30%			1,968,029	70%		
Other rural								
Moderately Vulnerable	537,541	16%	493,581	581,500	1,291,612	40%	1,247,653	1,335,572
Highly Vulnerable	947,849	29%	906,902	988,795	488,751	15%	447,805	529,698
	1,485,389	45%			1,780,364	55%		

6. Conclusion

Many middle-income countries, including Turkey, have experienced rapid growth in recent years which has resulted in rapid urbanization. As a result of rapid growth and urbanization, low incomes and market imperfections in rural incomes have lost their immediacy in the minds of many researchers and policy makers. However, record high food prices in 2007, 2008, and 2010, together with the Great Recession since 2008, have brought agriculture and food back to the agenda of national and international policy makers. The agricultural price increases have profoundly impacted the world's poor who spend a larger share of their budget on food, and the majority of the research community has so far rightly focused on the plight of the poor in low-income countries (Meijerink et al., 2011; Wise and Murphy 2012). Nevertheless, the rural poor in middle-income countries also deserve attention. This paper demonstrates the importance of self-produced food for the rural poor, even in middle-income countries. During 2009, when the impact of the Great Recession was felt most strongly in Turkey,

agriculture was the only sub-sector where employment had increased despite a persistent downward trend over the long-term (TurkStat, 2012).

I show that in rural areas of Turkey vulnerability to basic needs poverty does not differ according to whether or not a rural household engages in the consumption of self-produced food, but self-producing households are much less vulnerable to food poverty. In other words, self-producing households in rural Turkey are not poorer than other rural households, and they are much more food secure. These findings for Turkey closely parallel the findings of studies on other middle-income countries, such as Bulgaria, Romania, and Russia, where subsistence farming is found to play an important role in the safety net (see Mathijs and Noev (2004) on Albania, Bulgaria, Hungary and Romania; Seeth, et al., (1998) for Russia).

The ability to engage in subsistence agriculture provides a quasi-safety net for the most disadvantaged rural poor, and if the practice falls into disuse during periods of rapid agricultural commercialization, then these rural households will find themselves increasingly exposed to macro and idiosyncratic shocks. However, self-producing rural households are as vulnerable as other rural households to basic needs poverty. Like every other economic decision, choosing to produce for home consumption instead of devoting all household resources to market production has opportunity costs. Indeed, engaging in low-risk, low-return activities probably reduces overall income. Hence the findings of this paper should not be taken as a license to oppose all attempts to modernize rural areas. Rather my aim is to point out that most rural households value stability and security and are prepared make considerable efforts to ensure basic food security. In other words, policies designed to improve overall productivity at the expense of security are more likely to be resisted by rural dwellers. On the other hand, the results of this paper suggest that policies aimed at providing a safety net (such as direct income support) to rural households may actually advance the commercialization process by allowing households to engage in more risky, but more profitable, endeavors.

Finally, it has been almost a decade since the collection of the TurkStat 2003 data set. Since then, no comparable data set of the same depth and breadth, that includes food quantity and source, has been collected. As the recent experiences of Turkey after the Great Recession, and Eastern European countries show, food self-provisioning does not disappear monotonically as countries modernize. Instead, there is anecdotal evidence that self-provisioning is becoming popular even among urban middle class due to concerns with healthy eating. However, without reliable data collected at national level, we do not know the extent of such trends. It is past time that TurkStat, with its unparalleled experience in conducting Household Budget Surveys, update the 2003 data set or incorporate food quantity and source questions in its longitudinal studies.

Estimation Results for Equation 4

Table A1s are the estimation results of Equation 4 using OLS respectively for total spending and spending on food.

Table A1a
Estimation Results for Equation 4 for Total Consumption

Dependent Variable: log of pc. Expenditure	All sample		Urban		Self-provisioning rural		Other rural	
Any member of hh, health insurance dv	0.28	***	0.27	***	0.28	***	0.29	***
Hh size, adult equivalent	-0.05	***	-0.09	***	0.00	**	-0.04	***
Dummy variable for female hh head	-0.12	***	-0.12	***	0.02	***	-0.04	***
Age of hh head	0.01	***	0.01	***	0.01	***	0.01	***
Dummy variable for urban location	0.16	***						
Number of children in the hh	-0.09	***	-0.09	***	-0.07	***	-0.10	***
Hh head, literate dummy variable	0.14	***	0.14	***	0.16	***	0.04	***
Hh head, primary dummy variable	0.36	***	0.32	***	0.29	***	0.33	***
Hh head, secondary dummy variable	0.54	***	0.49	***	0.55	***	0.52	***
Hh head, high school dummy variable	0.73	***	0.70	***	0.53	***	0.65	***
Hh head, higher education dv	1.18	***	1.14	***	1.00	***	1.04	***
Any member of hh, salaried dv	0.16	***	0.21	***	0.15	***	0.04	***
Any member of hh, wage dv	-0.05	***	-0.02	***	-0.08	***	-0.14	***
Any member of hh, employer dv	0.62	***	0.65	***	0.56	***	0.60	***
Any member of hh, self-employed dv	0.16	***	0.22	***	0.12	***	0.17	***
Any member of hh, unpaid dv	0.00	***	0.09	***	-0.02	***	0.02	***
Any member of hh, strenuous labor dv	-0.13	***	-0.15	***	-0.06	***	-0.01	***
East Marmara dummy variable	-0.32	***	-0.34	***	-0.30	***	-0.41	***
Aegean dummy variable	-0.33	***	-0.32	***	-0.40	***	-0.39	***
West Marmara dummy variable	-0.29	***	-0.28	***	-0.29	***	-0.37	***
Central dummy variable	-0.29	***	-0.27	***	-0.39	***	-0.46	***
Mediterranean dummy variable	-0.34	***	-0.38	***	-0.28	***	-0.30	***
Central East dummy variable	-0.46	***	-0.51	***	-0.52	***	-0.47	***
Western Black sea dummy variable	-0.52	***	-0.46	***	-0.64	***	-0.56	***
Eastern Black sea dummy variable	-0.39	***	-0.39	***	-0.48	***	-0.42	***
North East dummy variable	-0.49	***	-0.53	***	-0.48	***	-0.54	***
North Central dummy variable	-0.46	***	-0.36	***	-0.65	***	-0.63	***
South East dummy variable	-0.55	***	-0.51	***	-0.69	***	-0.67	***
Logarithm of land value	0.01	***	0.02	***	0.03	***	0.01	***
Constant	4.52	***	4.75	***	4.32	***	4.72	***
Observations	25,764		18,278		4,154		3,332	
R-Squared	0.4641		0.493		0.2596		0.4415	

Table A1b

Estimation Results for Equation 4 for Food Consumption[19]

Dependent Variable: log of pc. Food expenditure	all sample		urban		self-provisioning rural		other rural	
any member of hh, health insurance dv	0.00	***	-0.01	***	0.02	***	0.02	***
hh size, adult equivalent	-0.02	***	-0.01	***	-0.04	***	-0.02	***
dummy variable for female hh head	0.07	***	0.08	***	0.03	***	0.07	***
Age of hh head	0.01	***	0.01	***	0.00	***	0.00	***
Dummy variable for urban location	-0.01	***						
number of children in the hh	-0.01	***	0.00	***	0.00	***	0.00	***
hh head, literate dummy variable	0.06	***	0.08	***	0.01	***	0.10	***
hh head, primary dummy variable	0.08	***	0.08	***	0.06	***	0.07	***
hh head, secondary dummy variable	0.10	***	0.11	***	0.10	***	0.04	***
hh head, high school dummy variable	0.13	***	0.14	***	0.11	***	0.01	***
hh head, higher education dv	0.16	***	0.17	***	0.08	***	0.07	***
any member of hh, salaried dv	0.00	***	-0.01	***	0.04	***	-0.01	***
any member of hh, wage dv	-0.01	***	-0.02	***	0.04	***	-0.02	***
any member of hh, employer dv	-0.02	***	-0.05	***	0.13	***	-0.08	***
any member of hh, self-employed dv	-0.01	***	-0.05	***	0.03	***	-0.01	***
any member of hh, unpaid dv	0.04	***	0.06	***	0.01	***	0.06	***
any member of hh, strenuous labor dv	-0.05	***	-0.06	***	-0.10	***	-0.03	***
East Marmara dummy variable	-0.09	***	-0.07	***	-0.33	***	-0.14	***
Aegean dummy variable	-0.10	***	-0.09	***	-0.32	***	-0.16	***
West Marmara dummy variable	-0.07	***	-0.08	***	-0.16	***	-0.10	***
Central dummy variable	-0.10	***	-0.11	***	-0.25	***	-0.13	***
Mediterranean dummy variable	-0.06	***	-0.03	***	-0.35	***	-0.10	***
Central East dummy variable	0.01	***	-0.01	***	-0.17	***	0.00	**
Western Black sea dummy variable	-0.04	***	-0.10	***	-0.16	***	-0.06	***
Eastern Black sea dummy variable	-0.02	***	-0.05	***	-0.12	***	-0.11	***
North East dummy variable	-0.02	***	0.06	***	-0.30	***	-0.09	***
North Central dummy variable	-0.02	***	-0.01	***	-0.28	***	-0.04	***
South East dummy variable	0.07	***	0.10	***	-0.26	***	0.07	***
logarithm of land value	0.00	***	0.01	***	0.00		0.00	***
logarithm of monthly expenditure	0.31	***	0.32	***	0.24	***	0.39	***
Constant	1.99	***	1.85	***	2.79	***	1.77	***
Observations	25,764		18,278		4,154		3,332	
R-Squared	0.2857		0.3219		0.2192		0.2635	

Robust z statistics; * significant at 10%; ** significant at 5%; *** significant at 1%; dv= dummy variable; hh= household. Pseudo R-statistics are reported for probit models.

Testing the Equality of Food Baskets for Each Sub-Group

The mean cost of per capita monthly food basket (enough to procure 2100 calories/day) for urban and rural households in the second quintile are 85 and 69 TL respectively (adjusted for household size using TurkStat methodology). Likewise the mean cost of food baskets for self-provisioning rural and other rural households are 64 and 77 TL respectively. There is a

[19] The only extra variable I include to column four is the natural logarithm of per capita monthly spending. I included monthly per capita spending as a control variable in order to get a better estimate for other variables.

real concern whether these observed differences are statistically significant. However, it is not possible to simply compare observed food budget of urban and rural household (or self-provisioning rural and other rural households) since most of the households do not consume exactly 2100 calories/day. For example, two households, one urban and one rural, may spend similar amounts on food but urban household quite possibly faces higher unit values which results in less calories for the same amount of spending. So even if we test the mean difference of food spending for each sub-group and conclude that they are statistically different we cannot be sure of the reason of difference. Instead, I calculate difference of two-means for each food category where there is at lest 2 observations. First, I test for equality of population variance using equation A1. If the variances are equal than I calculate standard error for difference of two-means using equations A2 and use A3 if population variances are statistically different. Finally I employ equation A4 for testing difference of two-means. Population variances turns out to be different almost all of the cases (except a few cases for quantity data, results are not presented here) hence I end up using A3 for estimating standard error for most of the time. Table A2 presents the results equation A4 (I choose alpha equal to 0.05 at every step). Columns 1 and 2 present the test results for difference of two-means for quantity and price, respectively, between urban and rural households. Test results show that, except for 6 categories, either quantity bought or mean prices paid by two populations are different. Other than pastry (and that is only for urban households), none of these categories constitute more than one percent of total calories consumed for either groups. Columns 3 and 4 present the test results for difference of two-means for quantity and price, respectively, between self-provisioning and other rural households. Both consumption quantity and mean prices are not statistically significantly different only for 15 food groups. Of these 15 food groups, only the egg category constitutes more than 1 percent of rural households' caloric consumption. As a result of difference of two-means tests, I conclude that representative food baskets constructed to be equivalent to 2,100 calories/day for each sub-group are significantly different from each other.

$$F_{n1,n2} = \frac{s_1^2}{s_2^2} \text{ where } \mathrm{H}_0 : \sigma_1^2 = \sigma_2^2 \text{ and } \mathrm{H}_1 : \sigma_1^2 > \sigma_2^2 \tag{A1}$$

$$\hat{\sigma}_{(\hat{X}_1 - \hat{X}_2)} = \sqrt{\frac{n_1 s_1^2 + n_2 s_2^2}{n_1 + n_2 - 2}} \sqrt{\frac{n_1 + n_2}{n_1 n_2}} \tag{A2}$$

$$\hat{\sigma}_{(\hat{X}_1 - \hat{X}_2)} = \sqrt{\frac{s_1^2}{n_1 - 1} + \frac{s_2^2}{n_2 - 1}} \tag{A3}$$

where n_1 and s_1 are the sample size and standard deviation of first sample.

$$t = \frac{\overline{X}_1 - \overline{X}_2}{\hat{\sigma}_{(\hat{X}_1 - \hat{X}_2)}} \, \mathrm{critical value\, t\text{-}inverse}(0.05, \mathrm{n}_1 + \mathrm{n}_2 - 2) \tag{A4}$$

Table A2
Difference of Two-Means Tests for All Food Categories

	Urban vs. Rural		Self-provisioning vs. Other rural	
Food category	**Quantity**	**Price**	**Quantity**	**Price**
Rice	not equal	not equal	not equal	not equal
Bread	not equal	not equal	not equal	equal
Pasta	not equal	not equal	not equal	not equal
Pastry	equal	equal	equal	equal
Other cereals	not equal	not equal	not equal	not equal
Cattle meat	not equal	not equal	not equal	not equal
Sheep and goat meat	not equal	not equal	not equal	not equal
Chicken	not equal	equal	not equal	equal
Cured meat	not equal	equal	not equal	equal
Other canned meat	equal	equal	equal	equal
Fish	not equal	equal	not equal	not equal
Milk	not equal	not equal	not equal	not equal
Yoghurt	not equal	not equal	not equal	not equal
Cheese	not equal	not equal	not equal	not equal
Other dairy products	equal	equal	equal	equal
Egg	not equal	not equal	equal	equal
Butter	not equal	not equal	equal	not equal
Margarine & vegetable oil	not equal	equal	not equal	equal
Olive oil	equal	equal	not equal	not equal
Other edible fats	not equal	not equal	not equal	not equal
Other edible animal fats	not equal	equal	equal	equal
Citrus fruits	not equal	equal	not equal	not equal
Banana	not equal	not equal	equal	equal
Apple	not equal	not equal	not equal	not equal
Pear	not equal	equal	not equal	not equal
Fruits with a hard core, plums cherry	not equal	equal	not equal	not equal
Fruits without a hard core, quince	not equal	equal	not equal	not equal
Other fruits	not equal	not equal	not equal	not equal
Dried fruits	not equal	equal	not equal	not equal
Leafy greens	not equal	not equal	not equal	not equal
Cabbage	not equal	not equal	not equal	not equal
Tomato, green pepper etc.	not equal	equal	not equal	not equal
Onion	not equal	not equal	not equal	equal
Dried vegetables	not equal	equal	not equal	not equal
Other canned vegetables	not equal	equal	equal	equal
Potato	not equal	equal	not equal	equal
Other root vegetables	not equal	not equal	equal	equal
Sugar	not equal	not equal	not equal	not equal
Jam and marmalade	not equal	equal	not equal	equal
Chocolate	equal	not equal	equal	not equal
Candy	not equal	not equal	not equal	equal
Ice-cream	not equal	not equal	not equal	not equal
Other candy	not equal	equal	equal	equal
Sauce	not equal	not equal	equal	equal
Coffee	not equal	equal	equal	equal
Tea	not equal	equal	not equal	equal
Cacao	equal	equal	equal	equal
Non-alcoholic beverages	equal	not equal	equal	equal
Fruit juice	equal	equal	equal	equal

Table A3
Mean Value of Food Expenditures for the Sub-Groups (TurkStat Formula is used for Adult Equivalence)

Variable	Obs	Mean	Std. Dev.	Min	Max
Whole sample	25,764	53.69	32.00	0	550.60
Urban	18,278	54.35	31.99	0	547.26
Rural	7,486	52.08	31.96	0	550.60
Self-provisioning rural	4,154	52.75	32.63	5.75	550.60
Other rural	3,332	51.24	31.08	0	517.28

Table A4
Comparison of Alternative Adult Equivalence Methodologies

adult	children >=14	children <14	Household size	TurkStat	OECD modified
1			1.0	1.8	1
2			2.0	2.7	1.5
2		1	3.0	3.4	1.8
2	1		3.0	3.4	2
2	1	1	4.0	4.0	2.3
2	2		4.0	4.0	2.5
2	1	2	5.0	4.5	2.6
3	2	2	7.0	5.6	3.6
4	2	2	8.0	6.1	4.1
4	2	3	9.0	6.5	4.4

*: Modal family in the 2003 HBS.

Poverty estimates where household size is adjusted with TurkStat methodology

Table A4 shows alternative poverty measures reported widely in the literature. The headcount rate reports the percentage of households that are below the corresponding poverty line. The poverty gap index adds up the percentage by which per capita expenditures fall below the poverty line on average (averaged over all observations – not only for poor households):

$$P_1 = \frac{1}{N}\sum_{i}^{N}\frac{(z - y_i)}{z} \qquad \text{if} \qquad y_i < z \tag{A5}$$

where z is the poverty line, N is the total sample size and y_i is the adult equivalent per capita expenditure. Intuitively, multiplying poverty gap index by poverty line will yield the minimum necessary amount of money to lift all poor people above poverty line. However, both the headcount poverty rate and poverty gap index violate the transfer principle for a good measure of welfare formulated by Dalton (1920). Dalton's transfer principle states that transfers from a poorer to a richer person should increase the poverty measure. For example, the headcount rate will decline by transferring

income from a person at the bottom of the scale to push a person just below the poverty line over it. An alterative poverty measure that satisfies Dalton's transfer principle is the poverty severity index where the poverty gap of the poor is squared, which effectively gives greater weight to the poorest:

$$P_2 = \frac{1}{N}\sum_{i}^{N}\left(\frac{(z - y_i)}{z}\right)^2 \quad \text{if} \quad y_i < z \tag{A6}$$

A general formula that encompasses headcount rate, poverty gap index, and poverty severity index is proposed by Foster, Greer and Thorbecke (FGT, 1984):

$$P_\alpha = \frac{1}{N}\sum_{i}^{N}\left(\frac{(z - y_i)}{z}\right)^\alpha, \ (\alpha \geq 0) \text{ and } \mathrm{y_i} < \mathrm{z} \tag{A7}$$

When α is equal to zero, the FGT measure is simply equal to headcount rate. When α is equal to one the FGT measure is equal to the poverty gap index. When α is bigger than one, the FGT measure captures the severity of poverty. For measuring the severity of poverty, α equaling two is the usual rule of thumb, although there is no a priori theoretical basis for preferring this to other values for α.

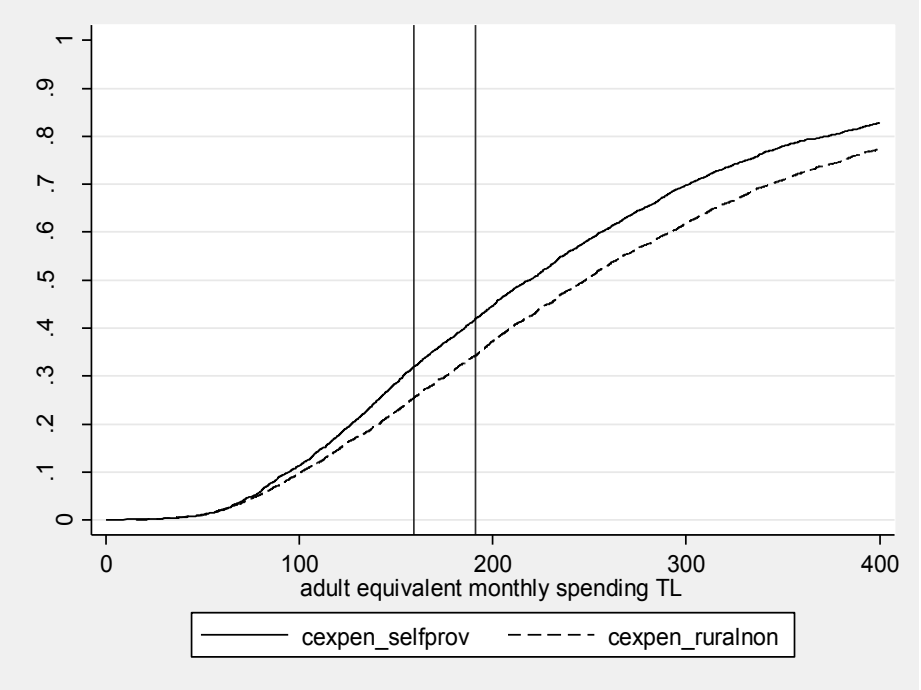
Table A5
Consumption and Food Poverty According to Basic Needs Method

Overall Poverty	**Urban, self-producing, and other rural poverty lines**		
	Headcount Rate (P0)	**Poverty Gap (P1)**	**Squared Poverty Gap (P2)**
Urban	0.22	0.07	0.03
Rural	0.31	0.10	0.04
Rural self-producing	0.30	0.09	0.04
Rural other	0.32	0.11	0.05
Total	0.26	0.08	0.04
Food Poverty	**Urban, self-producing and other rural poverty lines**		
	Headcount Rate (P0)	**Poverty Gap(P1)**	**Squared Poverty Gap(P2)**
Urban	0.47	0.14	0.06
Rural	0.38	0.11	0.05
Rural self-producing	0.30	0.08	0.03
Rural other	0.45	0.14	0.06
Total	0.44	0.13	0.06

For this data set, all three alternative poverty measures tell a similar story. Total consumption poverty is lower among urban households compare to both self-provisioning and other rural households. However, for food

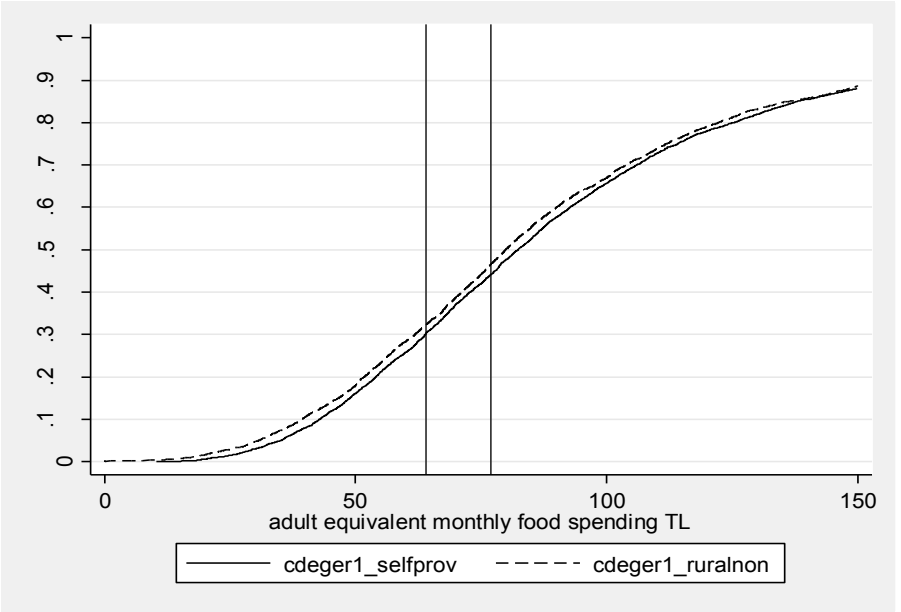
poverty, the situation is different. Poverty figures for urban and other rural households are significantly higher than measures for self-producing households.

Figure A1
Cumulative Percentage Distribution of Rural Population in Poverty



Only households with per capita monthly expenditure level less than 400 TL are included in order to focus on left tails. The two vertical lines are poverty lines from Table 1 at 159 TL for self-provisioning rural households and at 191 TL for other rural households.

Figure A2
Cumulative Percentage Distribution of Rural Population in Food Poverty



Only households with per capita monthly expenditure level less than 150 TL are included in order to focus on left tails. The two vertical lines are poverty lines from Table 1 at 64 TL for self-provisioning rural households and at 77 TL for other rural households.

Dalton, Hugh. 1920. The Measurement of the Inequality of Incomes. *Economic Journal* 30: 384–61.

Table A6
Difference of Two-Means test for Poverty Rate Estimates

	Consumption poverty			
	Urban	**Rural**	**Self-provisioning**	**Other rural**
Poverty rate	0.22	0.31	0.30	0.32
Standard error	0.3	0.6	0.8	0.9
#	18278	7486	4154	3332
Sigma (equation a3)	0.01		0.02	
T-stat	-12.36		-1.00	
Critical value	2.58		2.58	
Result	not equal		equal	
	Food Poverty			
	Urban	**Rural**	**self-provisioning**	**other rural**
Poverty rate	0.47	0.38	0.30	0.45
Standard error	0.4	0.7	0.8	1.0
#	18278	7486	4154	3332
Sigma (equation a3)	0.01		0.02	
T-stat	10.45		-7.04	
Critical value	2.58		2.58	
Result	not equal		not equal	

Table A7
Vulnerability to Total Consumption Poverty in Turkey, 2003

Next Period	Criterion	Current poor	Current non-poor	All sample
Whole sample				
Not vulnerable	v_h <=.26	0.06	0.55	0.61
Moderately vulnerable	0.5>= v_h >.26	0.07	0.14	0.22
Highly vulnerable	v_h >0.5	0.12	0.05	0.17
		0.26	0.74	1.00
Urban				
Not vulnerable	v_h <=.26	0.05	0.60	0.65
Moderately vulnerable	0.5>= v_h >.26	0.06	0.13	0.19
Highly vulnerable	v_h >0.5	0.11	0.05	0.16
		0.22	0.78	1.00
Rural self-producing				
Not vulnerable	v_h <=.26	0.10	0.48	0.58
Moderately vulnerable	0.5>= v_h >.26	0.08	0.16	0.24
Highly vulnerable	v_h >0.5	0.12	0.06	0.18
		0.30	0.70	1.00
Rural other				
Not vulnerable	v_h <=.26	0.06	0.48	0.54
Moderately vulnerable	0.5>= v_h >.26	0.09	0.14	0.23
Highly vulnerable	v_h >0.5	0.17	0.06	0.23
		0.32	0.68	1.00

Table A8
Vulnerability to Food Poverty in Turkey, 2003

Next Period	Criterion	Current poor	Current non-poor	All sample
Whole sample				
Moderately vulnerable	v_h =< 0.5	0.16	0.44	0.60
Highly vulnerable	v_h > 0.5	0.28	0.12	0.40
		0.44	0.56	1.00
Urban				
Moderately vulnerable	v_h =< 0.5	0.15	0.39	0.54
Highly vulnerable	v_h > 0.5	0.32	0.14	0.46
		0.47	0.53	1.00
Self-producing rural				
Moderately vulnerable	v_h =< 0.5	0.22	0.66	0.88
Highly vulnerable	v_h > 0.5	0.08	0.05	0.12
		0.30	0.70	1.00
Other rural				
Moderately vulnerable	v_h =< 0.5	0.16	0.40	0.56
Highly vulnerable	v_h > 0.5	0.29	0.15	0.44
		0.45	0.55	1.00

Calculation of vulnerability Score

The calculation of v-hat (Equation 5) is actually tries to somewhat address the above concern about highly vulnerable households. Equation 5 is basically probablility distribution of 'poverty line minus predicted household expenditures divided by its own standard error'. I constructed the following Table to clarify how Equation 5 works. Household F's expected expenditures is a lot less than poverty line (so the numerator in Equation 5 is positive) and have low standard error than unsurprisingly it will have a high positive value for v_hat (highly vulnerable). Household D's expected expenditures are over poverty line (so the numerator is negative) but since its expected standard error is high than it will have a low negative raw score, and depending on cumulative distribution function, Household D can also be classified as highly vulnerable.

Table A9
Alternative Scenarios for Vulnerability Score Calculation (Equation 5)

Household	Expected expenditure	Numerator	Expected standard error (denominator)	Equation 5 raw score	Position at Probability Distr.	v-hat score	Predicted Vulnerability
A (current non-poor)	A lot more than poverty line	Highly negative	Low	Higly negative	Close to left tail	Low	Low
B (current non-poor)	Moderately above poverty line	Moderately negative	Very High	Slightly negative	Beyond middle	Middle to high	Moderate to high
C (current non-poor)	Slightly above poverty line	Slightly negative	Low	Moderately negative	Close to middle	Low to middle	Low to moderate
D (current non-poor)	Slightly above poverty line	Slightly negative	High	Slightly negative	Beyond middle	Middle to high	Moderate to high
E (current poor)	Slightly less than poverty line	Slightly positive	Low	Moderately positive	Beyond middle	Middle to high	Moderate to high
F (current poor)	A lot less than poverty line	Highly positive	low	Highly positive	Close to right tail	High	High

Table A10
Headcount Hunger Rate (Households Whose Total Expenditure is Less than Cost of Food Basket)

	whole sample	Urban	Rural	self-provisioning	other rural
poverty rate	0.032	0.027	0.034	0.025	0.042
standard error	0.176	0.162	0.182	0.156	0.202
#	25,764	18,278	7,486	4,154	3,332
Sigma (Equation A3)		0.00		0.00	
t-stat		-3.05		-4.15	
critical value		2.58		2.58	
result		not equal		not equal	

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Özet

Türkiye'de kendi üretiminden tüketim ve yoksulluğa karşı kırılganlık

Yoksullukla mücadelede ileriye dönük politika geliştirebilmek için yoksulluğa karşı kırılganlığı araştırmak kritik önemdedir. Bu çalışmada kendi üretiminden tüketimi, kırılganlığı azaltabilecek bir strateji olarak iki açıdan irdelemekteyim: gıda ve gıda dışı tüketim. İlk olarak, kendi üretiminden tüketim yapan kırsal hanelerin tüketim sepetinin tamamen perakende satın alınan gıdayla beslenen diğer kırsal hanelerin tüketim sepetinden farklı ve daha ucuz olduğunu göstermekteyim. İkinci olarak, kendi üretiminden tüketim yapan hanelerin toplam tüketim söz konusu olduğunda diğer kırsal haneler kadar kırılgan olmalarına rağmen; gıda yoksulluğu söz konusu olduğunda kırılganlıklarının çok daha az olduğunu göstermekteyim. Bu bulgular orta gelir düzeyindeki ülkelerde bile kendi üretiminden tüketim yapabilmenin yoksulluğa karşı kırılganlığı azaltıcı bir strateji olarak öneminin altını çizmiştir.

*Anahtar kelimeler***:** Yoksulluk sınırı; savunmasızlık; Türkiye.

JEL kodları: Q12, I32.